Ace 11 (1-4)

Vol. VII. No. 1—4.
1955

DPP. 2 VII. 1—4
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DIRECTORATE OF PLANT PROTECTION, QUARANTINE & STORAGE
MINISTRY OF FOOD AND AGRICULTURE, GOVERNMENT OF INDIA

PLANT PROTECTION BULLETIN

SCIENCE IN PRACTICE

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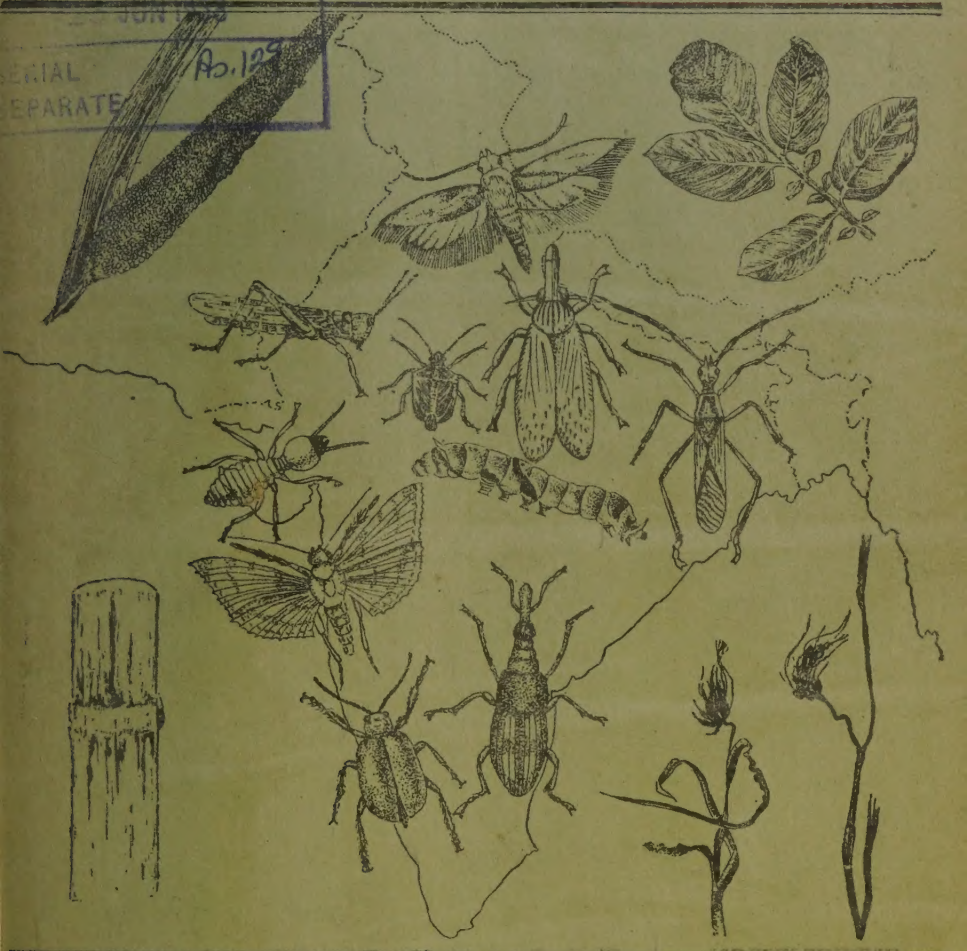

Pests & Diseases Number

ISSUED BY THE PLANT PROTECTION ADVISER TO THE GOVERNMENT OF INDIA, NEW DELHI

Sale Price :—Rs. 4/- or 6 Sh. per copy.

PUBLISHED QUARTERLY

		Inland	Foreign
SUBSCRIPTION RATES	Single Copy	Re. 1/-	1 sh. 6 d.
	Annual	Rs. 4/-	6 sh.

Available from :—

Manager of Publications, Government of India
Old Secretariat, Civil Lines, Delhi—8.

NOTE

This Bulletin is intended to disseminate information about plant protection measures and campaigns adopted or conducted in different parts of India as well as about the advances made in the field of plant protection in other parts of the world to the extent possible. It is also intended to give information about the latest developments in the production of pesticides, plant protection equipment and techniques of pests and plant disease control. Elaborate scientific papers on Entomology or Plant Pathology or on the chemistry of pesticides would normally not be in place in this Bulletin but short notes dealing with the behaviour or distribution of pests and plant diseases and brief reports on their epidemiology, control, etc., would be welcome. Plant protection has now become such a specialised science and yet it is diversified and consequential in its character and application that it is difficult to define the scope of the subject with any great precision. The general rule to be observed is that any information which can be useful in preventing or controlling damage to crops, fruit trees, plantations and stored agricultural commodities caused by pests and diseases should be a fit subject for publication in this Bulletin.

Manuscripts submitted for publication in the Plant Protection Bulletin must be typed in double spacing on one side of the paper only, leaving ample margin on the left, at the bottom and on the top of the page. Photographs or drawings must be accompanied by a clearly typed legend which should appear under them. In addition, they should bear on their reverse in clear handwriting in pencil the name or names of the author or authors and the article which they illustrate. While this Directorate will take every care to include only such material in the Bulletin as may be considered reasonably correct and useful, it can accept no responsibility for every statement made and every opinion expressed.

Due to various unavoidable reasons, the appearance of this Bulletin has been far behind the scheduled time. While this must be greatly regretted, every effort would be made to avoid delays in future. Those who may read this Bulletin are invited to offer criticisms and suggestions for its improvement.

K. B. Lal
Plant Protection Adviser to the
Government of India

PESTS AND DISEASES OF AGRICULTURAL IMPORTANCE IN INDIA

PREFACE

The Publication of the present lists of pests and diseases of agricultural importance in India owes its origin to a suggestion made by Dr. Punjabrao S. Deshmukh, Union Minister for Agriculture, who desired that wide publicity should be given to them. It is hoped that the lists would prove of interest and value for reference and other purposes alike to specialists, extension workers and students of agriculture.

The lists are far from being handbooks of plant protection. They only give the English and seientific names of insect and other pests, diseases and parasitic plants, which may cause damage to crops, fruit trees and stored agricultural commodities in different parts of India. While the latest scientific names of the pests and the disease organisms have been given, the lists obviously are not intended to settle any disputed points of scientific nomenclature. Systematic Entomologists and Mycologists have their own whims and knacks of changing names and groupings without warning, leaving those who have to deal with pests and diseases to call them whatever they may. This is not a complaint against Systematic Entomologists and Mycologists, who have very useful functions to perform even in the field of plant protection, but only to illustrate the plight of the plant protection workers when they find that a long-cherished name of a pest or a disease has been changed overnight to something beyond recognition.

The distribution of the pests and the diseases given in the lists is also not exhaustive. Not only has the world distribution of the pests and the diseases not been attempted at all, but even with reference to India alone the distribution always may not appear as complete. The effort, however, has been to indicate the States or the areas wherein particular pests or diseases have been well known or have acquired notoriety on account of the damage they cause to crops, etc. More difficult has been the task of indicating the economic status of the pests and the diseases. Sometimes the same pest is very serious in some areas of the country and is not so in some others. Sometimes in the same area, the same pest or disease is not always of great importance, but assumes importance in certain years. The remarks about the economic status, therefore, are only indicative and even incomplete in some instances. The measures of control given in the lists are likewise those which have been usually and fairly successfully practised in the different States of India. They do not lay claim to any finality and, indeed, pest and disease control methods are developing so fast and variously that it would be unwise to consider almost any recommendation as final for any long time. Further, the measures have only been indicated. No details could be given in this publication.

While there are publications dealing with the insect pests and diseases of crops, etc., in several of the States and while there are a few others dealing with the pests of specific crops, for example, those of sugarcane, jute and paddy in all India; there is no publication which lists the pests and diseases of crops, fruit trees and stored agricultural commodities in the country as a whole at one place. The lists, therefore, should answer a need which should have been fulfilled long ago. They, probably, have many shortcomings which it has not been possible to remove entirely. If an attempt is made to make them anything like perfect, the lists would be indefinitely held up for publication.

This Directorate would welcome gratefully any criticism, comments or suggestions for improvement, which specialists and plant protection workers may find it necessary to make and to communicate to us.

K. B. Lal
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Government of India

Directorate of Plant Protection,
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New Delhi

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Insects and other Pests of Agricultural Importance in India

Crop	Pest	Distribution	Economic Status	Control Measures Undertaken
CEREALS				
Paddy	1. Swarming caterpillar *Spodoptera mauritia* Boisd.	Andhra, Assam, Bihar, Bombay, Hyderabad, Madras, Madhya Bharat, Madhya Pradesh, Mysore, Orissa, Rajasthan, Saurashtra, Travancore-Cochin, Tripura, Uttar Pradesh, Vindhya Pradesh, West Bengal.	Serious	1. Dusting with 5% BHC or DDT. 2. Spraying with 0.25% DDT.
	2. Rice case worm *Nymphula depunctalis* Guen.	Andhra, Assam, Bihar, Bombay, Coorg, Hyderabad, Madras, Madhya Pradesh, Mysore, Orissa, Punjab, Travancore-Cochin, Tripura, Uttar Pradesh, Vindhya Pradesh, West Bengal.	Serious	1. Dusting with 5% BHC or DDT. 2. Spraying with 0.25% DDT.
	3. Rice hispa *Hispa armigera* Oliv.	Assam, Bihar, Bombay, Coorg, Hyderabad, Madhya Bharat, Madhya Pradesh, Mysore, Orissa, PEPSU, Punjab, Travancore-Cochin, Tripura, Uttar Pradesh, Vindhya Pradesh, West Bengal.	Moderate	1. Dusting with 5% BHC. 2. Spraying with 0. 25% DDT. 3. Clipping off and destroying the leaf tips in nurseries while transplanting seedlings.

Crop	Pest	Distribution	Economic Status	Control Measures Undertaken
Paddy (*contd.*)	4. Paddy stem borer *Schoenobius incertellus* Wlk.	Andhra, Assam, Bihar, Bombay, Coorg, Hyderabad, Madras, Madhya Pradesh, Mysore, Orissa, Punjab, Travancore-Cochin, Uttar Pradesh, Vindhya Pradesh, West Bengal.	Moderate	1. Dipping seedlings in 0.1% DDT suspension before transplanting. 2. Ploughing up and destroying the stubbles after harvest. 3. Collection and destruction of egg clusters in nursery plants. 4. Spraying with 0.025% Parathion in the field.
	5. Rice bug *Leptocorisa acuta* Thun. *Leptocorisa varicornis* Fabr.	Assam, Bhopal, Bihar, Bombay, Coorg, Delhi, Madhya Bharat, Madhya Pradesh, Madras, Orissa, PEPSU, Punjab, Rajasthan, Travancore-Cochin, Tripura, Uttar Pradesh, Vindhya Pradesh, West Bengal.	Serious	1. Dusting with 5% BHC. 2. Spraying with 0.25% DDT.
	6. Rice grasshopper *Hieroglyphus banian* Fabr.	Andhra, Assam, Bhopal, Bihar, Bombay, Coorg, Delhi, Madhya Bharat, Madhya Pradesh, Madras, Mysore, Orissa, PEPSU, Punjab, Rajasthan, Uttar Pradesh, Vindhya Pradesh, West Bengal.	Serious	Dusting with 5% BHC.
	7. Phadka grasshopper *Hieroglyphus nigrorepletus* Bol.	Ajmer, Bombay, Bihar, Rajasthan, Uttar Pradesh.	Serious	Dusting with 5% to 10% BHC.
	8. Green jassid *Nephotettix bipunctatus* Fabr. *N. apicalis* Mots.	Andhra, Assam, Bhopal, Bihar, Bombay, Madhya Bharat, Madhya Pradesh, Madras, Mysore, Orissa,	Serious	1. Spraying with 0.15% DDT. 2. Dusting with 5% DDT, preferably after draining the

		Travancore-Cochin, Uttar Pradesh, West Bengal.		fields.
9.	White jassid *Tettigoniella spectra* Dist.	South India.	Serious	1. Spraying with 0. 15% DDT. 2. Dusting with 5% DDT.
10.	Gall fly *Pachydiplosis oryzae* Wood-Mason	Andhra, Assam, Bihar, Bombay, Madhya Pradesh, Madras, Mysore, Orissa, West Bengal.	Moderate	1. Light trapping at the time of sowing for a fortnight. 2. Spraying with 0. 25% DDT.
11.	Blue beetle *Leptispa pygmoea* Baly.	Bombay, Coorg, Madras, Mysore, Travancore-Cochin.	Moderate	Dusting with 5% BHC.
12.	Hairy caterpillar *Nisaga simplex* Wlk.	Coorg.	Mild	Dusting with 10% BHC in early stages.
13.	Army worm *Cirphis unipuncta* Haw.	Assam, Hyderabad, Madhya Bharat, Madya Pradesh, Madras, Mysore, Rajasthan, Uttar Pradesh, West Bengal.	Mild	Dusting with 5% BHC or DDT.
14.	Paddy leaf roller *Cnaphalocrocis medinalis* Guen.	Andhra, Madras, Orissa, West Bengal.	Mild	1. Dusting with 10% BHC. 2. Spraying with 0.25%DDT.

Crop	Pest	Distribution	Economic Status	Control Measures Undertaken
Paddy (*contd.*)	15. Mealy bug *Ripersia oryzae* Gr.	Andhra, Bihar, Madras, Mysore, Orissa, West Bengal.	Mild	Spraying with 0.5% BHC or with 0.08% Malathion @ one ounce 50% emulsion in four gallons of water.
	16. Fulgorid bug *Nilaparvata lugens* Stol.	Andhra, Madras, Uttar Pradesh.	Mild	Dusting with 5% BHC.
	17. Thrips *Thrips oryzae* Wlk.	South India.	Mild	Dusting with 5% BHC.
	18. Root weevil *Echinocnemus oryzae* M.	-do-	Mild	Applying super-phosphate plus ammonium sulphate or mixing 5% BHC dust to the soil before sowing.
	19. Weevil *Tanymecus indicus* Fst.	Bihar, South India, Uttar Pradesh, West Bengal.	Mild	Flooding the seed-beds.
	20. Paddy eelworm *Anguillulina angusta* G.	Bihar, Uttar Pradesh.	Serious	Fumigating soil with D.D. soil fumigant one month before sowing.
Wheat & Barley	1. Termites *Odontotermes (Cyclotermes) obesus* R. & other spp.	All over the plains of India.	Serious	1. Mixing 5% BHC dust in the soil @ 10 to 15 lbs/acre. 2. Mixing 3% Chlordane in soil @ 15 lbs/acre.

2.	Weevil *Tanymecus indicus* Fst.	Uttar Pradesh, West Bengal.	Moderate	Mixing 5% BHC or DDT dust in the soil @10 to 15 lbs/acre.
3.	Aphis *Rhopalosiphum* (*Aphis*) *maidis* Fitch. *Sitobion avenae* Fabr.	All over wheat growing regions of India.	Moderate	1. Spraying with Nicotine sulphate (1 : 800). 2. Dusting with 5% BHC.
4.	Cutworm *Agrotis ypsilon* Rott. *A. flammatra* Schiff.	Ajmer, Bhopal, Bihar, Madhya Bharat, Punjab, Rajasthan.	Mild	Dusting ground around plants with 3% to 5% DDT.
5.	Surface grasshopper *Chrotogonus* spp.	Bhopal, Orissa, PEPSU, Punjab.	Mild	Dusting with 5% BHC.
6.	Army worm *Cirphis unipuncta* Haw.	Bihar, Punjab, Rajasthan, Uttar Pradesh.	Moderate	-do-
7.	Ear cockle *Anguillulina tritici* G.	Bihar, Delhi, PEPSU, Punjab, Rajasthan, Uttar Pradesh.	Serious	1. Eradication of affected ear-heads. 2. Selection of seed by floatation method.

Crop	Pest	Distribution	Economic Status	Control Measures Undertaken
Jowar, Maize, Bajra and Lesser millets	1. Deccan wingless grasshopper *Colemania sphenarioides* Bol.	Andhra, Bombay, Hyderabad, Madhya Pradesh, Madras, Mysore, Saurashtra.	Serious	Dusting with 5% to 10% BHC.
	2. Phadka grasshopper *Hieroglyphus nigrorepletus* Bol.	Ajmer, Bihar, Delhi, Madras, Rajasthan, Uttar Pradesh.	Serious	-do-
	3. Rice grasshopper *Hieroglyphus banian* Fabr.	Bihar, Madras, Orissa, PEPSU, Uttar Pradesh.	Mild	-do-
	4. Kutra (Red hairy caterpillar) *Amsacta moorei* But. *A. albistriga* Wlk.	Bhopal, Bihar, Bombay, Delhi, Kutch, Orissa, PEPSU, Punjab, Rajasthan, Saurashtra, South India, Uttar Pradesh.	Serious	1. Dusting with 10% BHC. 2. Spraying with 0.25% BHC. (Both measures effective against young caterpillars only). 3. Using light traps against moths.
	5. Stem borer *Chilo zonellus* Swinh.	Assam, Bhopal, Bihar, Bombay, Delhi, Hyderabad, Kutch, Madhya Bharat, Madhya Pradesh, Madras, Mysore, Orissa, PEPSU, Punjab, Rajasthan, Saurashtra, Uttar Pradesh, Vindhya Pradesh, West Bengal.	Moderate	Ploughing up and destruction of stubbles after harvest.
	6. Pink borer *Sesamia inferens* Wlk.	Bihar, Bombay, Hyderabad, Uttar Pradesh.	Mild	-do-

7. Army worm *Cirphis unipuncta* Haw.	Bihar, Bombay, Madhya Bharat, Madhya Pradesh, Mysore, Rajasthan.	Mild	1. Dusting with 5% BHC or DDT. 2. Spraying with 0.25% DDT.
8. Aphis *Rhopalosiphum maidis* Fitch.	Bhopal, Bihar, Bombay, Punjab, Uttar Pradesh.	Mild	Spraying with Nicotine sulphate 40% (1 :800).
9. Cutworm *Agrotis ypsilon* Rott. *A. flammatra* Schiff. *Euxoa segetis* Schiff.	Ajmer, Bhopal, Bihar, Delhi, Himachal Pradesh, Madhya Bharat, Orissa, PEPSU, Punjab, South India, Uttar Pradesh, West Bengal.	Mild	Dusting with 5% DDT or Chlordane near the base of plants.
10. Jowar earhead bug *Calocoris angustatus* Leith.	Andhra, Bombay, Hyderabad, Madhya Pradesh, Madras, Mysore.	Mild	Dusting with 5% BHC.
11. Lucerne caterpillar *Laphygma exigua* Hb.	Hyderabad, Madhya Pradesh, Madras, Mysore, PEPSU, Punjab.	Moderate	-do-

Crop	Pest	Distribution	Economic Status	Control Measures Undertaken
Jowar, Maize, Bajra and Lesser millets (*Contd.*)	12. Black hairy caterpillar *Estigmene lactinea* Cram.	South India.	Serious	Same as for red hairy caterpillar.
	13. Leaf beetle *Monolepta signata* Oliv.	Madras State.	Mild	Dusting with 5% BHC.
	14. Flea beetle *Chaetocnema pusaensis* Manl.	-do-	-do-	-do-
	15. Leaf beetle *Lema downesi* Baly.	Bihar and South India.	-do-	-do-
	16. White borer *Saluria inficita* Wlk.	Madras State.	Moderate	Using light traps in nurseries to attract moths.
	17. Root aphis *Tetraneura hirsuta* Baker	-do-	-do-	Mixing irrigation water with crude oil emulsion or Malathion 50% emulsion (1 oz. in 8 gallons of water).
	18. Stem fly *Atherigona stripalpus* Mall.	South India.	-do-	Destroying affected shoots.
	19. Stem borer *Anadastus parvulus* Wlk.	-do-	Mild	-do-

	20. White grubs *Xylotrupes gideon* Lin. *Lachnosterna longipennis* Bl. *Anomala polita* Bl. *A. rugosa* Arrow. *A. dimidiata* Hope.	Hilly districts of Himachal Pradesh and Uttar Pradesh.	Moderate	Treatment of soil with 5% Chlordane dust.
PULSES Gram and Peas.	1. Gram caterpillar *Heliothis armigera* Hb.	Assam, Bhopal, Bihar, Bombay, Delhi, Madhya Pradesh, Madras, Mysore, PEPSU, Punjab, Uttar Pradesh, Vindhya Pradesh, West Bengal.	Mild	Dusting with 5% BHC.
	2. Gram cutworms *Euxoa segetis* Schiff. *Agrotis ypsilon* Rott. *A. flammatra* Schiff.	Same as in case of Jowar, Maize, Bajra, and lesser millets.	Mild	Dusting with 5% BHC.
	3. Red hairy caterpillar *Amsacta moorei* But. *A. albistriga* W1k.	Andhra, Bihar, Bombay, Delhi, Himachal Pradesh, Madras, Orissa, PEPSU, Punjab, Rajasthan, Saurashtra, Uttar Pradesh, Vindhya Pradesh.	Serious	1. Dusting with 5 to 10% BHC. 2. Spraying with 0.25% BHC. (for young stages of caterpillar). 3. Use of light traps against moths.
	4. Pea leaf miner *Phytomyza atricornis* Meign.	Bhopal, Bihar, Delhi, Orissa, Punjab, Uttar Pradesh, West Bengal.	Mild	1. Spraying with 0.25% DDT. 2. Spraying with Nicotine sulphate (1 : 600).

Crop	Pest	Distribution	Economic Status	Control Measures Undertaken
	5. Pea semi-looper *Plusia orichalcea* Fabr.	Bhopal, Bihar and Uttar Pradesh.	—	1. Dusting with 5% BHC. 2. Spraying with 0.1% DDT.
	6. Pea stem borer *Melanagromyza phaseoli* Coq.	Bihar, Madras, Punjab, Uttar Pradesh.	—	Spraying with 0.1% DDT.
	7. Tur pod fly *Agromyza obtusa* M.	Bihar, Bombay, Delhi, Madhya Pradesh, Mysore, Orissa, Uttar Pradesh, West Bengal.	Mild	Spraying with 0.25% DDT.
	8. Pod borer *Adisura atkinsoni* Moore	Andhra, Bihar, Madras & Mysore.	Mild	Spraying with 0.25% DDT.
SUGAR-CANE	1. Termites *Odontotermes assmuthi* Hlmgr. *O. obesus Romb.* *Microtermes obesi* Hlmgr. *Trinervitermes heimi* Wasm.	All sugarcane growing areas.	Moderate	Dusting furrows with 5% BHC or 5% Chlordane 15 to 20 lbs per acre. Use of aldrin as dust or spray @ 1 lb. of pure chemical per acre.
	2. Sugarcane leaf hopper *Pyrilla perpusilla* Wlk.	All sugarcane growing areas.	Serious	1. Dusting with 5% BHC. 2. Spraying with pure Endrin @ 0.1 lb. per acre.

3. Stem borers *Chilotraea infuscatella* Sn. *Chilo tumidicostalis* Hmps. *Proceras indicus* Kapur *Chilotraea auricilia* Dudg.	Andhra, Assam, Bhopal, Bihar, Bombay, Delhi, Hyderabad, Madhya Bharat, Madhya Pradesh, Madras, Mysore, Orissa, PEPSU, Punjab, Rajasthan, Tripura, Uttar Pradesh, West Bengal.	—	1. Earthing up of young crop followed by irrigation. 2. Removal of dead heart and killing larvae by means of spike thrust method. 3. Spraying or dusting with BHC or spraying with Endrin.
Bissetia steniella Hmps.	Punjab, PEPSU and Uttar Pradesh.	—	1. Ploughing up and destroying the stubbles. 2. Removing infested tops during July to September.
4. Pink borer *Sesamia inferens* Wlk.	Bhopal, Bihar, Delhi, Madhya Pradesh, Madras, Mysore, Orissa, PEPSU, Punjab, Uttar Pradesh.	Moderate	Ploughing up and destruction of stubbles after harvest.
5. Root borer *Emmalocera depressella* Swinh.	Bhopal, Bihar, Madhya Bharat, Madhya Pradesh, Madras, Mysore, PEPSU, Punjab, Uttar Pradesh.	—	Ploughing up and destroying the stubbles.
6. Top borer *Scirpophaga nivella* Fabr.	Assam, Bhopal, Bihar, Bombay, Delhi, Madhya Pradesh, Madhya Bharat, Madras, Mysore, Orissa, PEPSU, Punjab, Rajasthan, Uttar Pradesh, Vindhya Pradesh and West Bengal.	Serious in many areas	1. Removal and destruction of affected shoots. 2. Spraying with BHC or Endrin.
Psara phaeopteralis Guen.	Mysore, Madras (Coimbatore).	Mild	Dusting with 5% BHC.

Crop	Pest	Distribution	Economic Status	Control Measures Undertaken
SUGARCANE (*Contd.*)	7. Army worm *Cirphis unipuncta* Haw.	Bombay, Punjab, Utter Pradesh.	Moderate	Dusting with 5% BHC or DDT.
	8. Sugarcane whitefly *Aleurolobus barodensis* Mask.	Andhra, Bhopal, Bihar, Bombay, Delhi, Madhya Bharat, Madhya Pradesh, Madras, Orissa, Punjab, PEPSU, Uttar Pradesh, Vindhya Pradesh and West Bengal.	Mild	Spraying with 0.25% BHC.
	Neomaskellia bergii Sign.	Bihar, Bombay, Madhya Pradesh and South India.	Moderate	Spraying with 0.25% BHC.
	9. Sugarcane black bug *Macropes excavatus* Dist.	Bihar, Delhi, Punjab and Uttar Pradesh.	Mild	Spraying with 0.16% DDT or 0.25% BHC directing the spray from the top into the central whorl of leaves.
	10. Sugarcane thrips *Fulmekiola saccharicida* A.&M.	Bihar.	Mild	1. Dusting with 5% BHC. 2. Spraying with 0.16% BHC.
	11. Sugarcane Scale *Icerya pilosa nardi* Green	Delhi, Mysore Madras, (Coimbatore), Uttar Pradesh.	Mild	Spraying with Lime Sulphur.
	12. Phadka grasshopper *Hieroglyphus nigrorepletus* Bol.	Bihar, Uttar Pradesh.	Moderate	Dusting with 5% BHC.

13. Rice grasshopper				
	H. banian Fabr.	Bihar, Uttar Pradesh.	Moderate	Dusting with 5% BHC.
	Choroedocus illustris Wlk.	Mysore, Madras (Coimbatore).	Mild	Dusting with 5% BHC.
14. Sugarcane mite *Paratetranychus indicus* Hirst.		Bihar, Hyderabad, PEPSU, Punjab Uttar Pradesh.	Mild	Spraying with Lime Sulphur.
FIBRE CROPS				
Cotton				
1. Cotton jassid	*Empoasca devastans* Dist.	Assam, Bhopal, Bihar, Bombay, Delhi, Madhya Pradesh, Madras, Orissa, PEPSU, Punjab, Rajasthan, Uttar Pradesh, Vindhya Pradesh.	Serious	1. Dusting with 5% BHC. 2. Spraying with 0.1% DDT.
2. Pink bollworm	*Platyedra gossypiella* Saund.	Assam, Bhopal, Bihar, Bombay, Delhi, Madhya Bharat, Madhya Pradesh, Madras, Mysore, Orissa, PEPSU, Punjab, Uttar Pradesh.	Serious	1. Sun treatment of seed. 2. Fumigating seed with Methyl bromide.
3. Spotted bollworms	*Earias insulana* Boisd. *E. fabia* Stoll.	Bihar, Bombay, Delhi, Madhya Pradesh, Orissa, PEPSU, Punjab, Uttar Pradesh, Vindhya Pradesh.	Serious	1. Removal of cotton sticks and stubbles in early winter before sprouting. 2. Avoiding ratoon crops.
4. Cotton leaf roller	*Sylepta derogata* Fabr.	Assam, Bhopal, Bihar, Delhi, Kutch, Madhya Pradesh, Madras, Mysore, PEPSU, Punjab, Saurashtra, Uttar Pradesh, West Bengal.	Moderate	1. Picking and destroying rolled leaves. 2. Spraying with 0.25% DDT or BHC.

Crop	Pest	Distribution	Economic Status	Control Measures Undertaken
Cotton (*contd.*)	5. Red cotton bug *Dysdercus cingulatus* Fabr.	Assam, Bhopal, Bihar, Delhi, Kutch, Madhya Bharat, Madhya Pradesh, Orissa, PEPSU, Saurashtra, Uttar Pradesh, Vindhya Pradesh.	Mild	1. Dusting with 5% BHC. 2. Spraying with 0.25% DDT.
	6. Cotton white fly *Bemesia tabaci* Guen.	Bihar, Bombay, Delhi, PEPSU, Punjab.	Mild	Spraying with 0.25% BHC.
	7. Cotton aphis *Aphis gossypii* Glov.	Andhra, Bombay, Delhi, Madhya Pradesh, Madras, Mysore, PEPSU, Punjab, Rajasthan, Uttar Pradesh.	Mild	1. Spraying with Nicotine sulphate 40% (1 : 800). 2. Dusting with 5% BHC.
	8. Dusky cotton bug *Oxycarenus laetus* Kirby	Andhra, Bihar, Madras, PEPSU, Madras, Punjab, Uttar Pradesh.	Moderate	Dusting with 5% BHC.
	9. Grey weevil *Myllocerus maculosus* Desb.	Bihar, Bombay, Madhya Pradesh, Madras, Punjab, Uttar Pradesh.	Mild	Dusting with 5% BHC.
	10. Cotton stem weevil *Pempheres affinis* Fst.	Andhra, Mysore, Madras.	Mild	Destruction of affected plants.

	11. Cotton stem borer *Sphenoptera gossypii* Kirby	Bombay, Hyderabad, Madhya Pradesh, Madras, Mysore, Punjab.	Serious	Destruction of affected plants.
Jute	1. Jute semi-looper *Anomis sabulifera* Guen.	Assam, Bihar, Bombay, Madhya Pradesh, Madras, Orissa, Uttar Pradesh, West Bengal.	Moderate	1. Spraying with 0.25% BHC. 2. Dusting with 5% BHC.
	2. Bihar hairy caterpillar. *Diacrisia obliqua* Wlk.	Assam, Bihar, Orissa, Uttar Pradesh, West Bengal.	Mild	1. Dusting with 5% to 10% BHC. 2. Spraying with 0.25% to 0.5% DDT.
	3. Jute apion			
	Apion corchori Marshall	Assam, West Bengal.	Serious	Weeding and destruction of infested plants.
	Cleoporus lefevrei Duviv.	West Bengal.	Mild	Spraying with 0.25% DDT.
	Nodostoma bengalense Var.	West Bengal.	Serious	Spraying with 0.25% DDT.
	4. Cricket *Brachytrypes achatinus* Stoll.	Bihar, West Bengal.	Serious	Mixing 10% BHC dust in soil@ 15 lbs. per acre before sowing or when crop is germinating.
	5. Weevil *Nupserha bicolor* Thoms.	West Bengal.	Moderate	Dusting with 5% BHC.

Crop	Pest	Distribution	Economic Status	Control Measures Undertaken
	6. Mealy bugs			
	Ferrisia virgata Ckll.	Assam, Bihar, Bombay, West Bengal.	--	Spraying 0.2% BHC or 50% Malathion emulsion (1 oz. in 4 gallons of water).
	Pseudococcus virgatus Ckll.	Madras.	—	-do-
	7. Jute scale	West Bengal.	Mild	Spraying with Lime Sulphur.
	Pinnaspis sp.			
	8. Mites	Assam, Bihar, Uttar Pradesh, West Bengal.	Mild	1. Spraying with Lime Sulphur.
	Tetranychus bioculatus Wood-Mason			2. Dusting with Sulphur.
	Hemitarsonemus laetus Banks.			
Sunn hemp	Shoot gall maker			
	Enarmonia pseudonectis Meyr.	Uttar Pradesh.	—	Dusting with 5% BHC.
OILSEEDS				
Til	1. Leaf and Pod caterpillar	Assam, Bihar, Bombay, Delhi, Madhya Pradesh, Madras, Orissa, Rajasthan, Uttar Pradesh, West Bengal.	Serious	Spraying with 0.25% DDT.
	Antigastra catalaunalis Dup.			
	2. Til gall fly	Bombay, Madhya Pradesh, Vindhya Pradesh.	Mild	Removing and destroying galls.
	Asphondylia sesami Felt.			

	3.	Hawk moth *Acherontia styx* West.	Assam, Bombay, Hyderabad, Madhya Pradesh, Rajasthan, Uttar Pradesh.	Serious	Spraying with 0.2% DDT.
Groundnut	*1.*	Red hairy caterpillar *Amsacta albistriga* Wlk.	As under pulses.	Serious	As given under pulses.
	2.	Surul puchi *Stomopteryx nerteria* M.	Madras, Mysore.	—	1. Destroying affected leaves. 2. Spraying with 0.25% DDT.
	3.	Vir puchi *Sphenoptera perotetti* Guen.	Andhra, Bihar, Bombay, Madhya Pradesh, Madras.	—	Destruction of affected shoots.
Mustard	*1.*	Mustard aphis *Lipaphis erysimi* Davis	Andhra, Bihar, Bombay, Delhi, Madhya Pradesh, Madras, Orissa, Punjab, Tripura, Uttar Pradesh, Vindhya Pradesh.	Serious	Spraying with Nicotine sulphate 40% (1:800).
	2.	Mustard sawfly *Athalia proxima* Klug.	Assam, Bihar, Bombay, Delhi, Hyderabad, Madhya Pradesh, Madras, PEPSU, Punjab, Uttar Pradesh and West Bengal.	Mild	Spraying with 0.1% DDT.

Crop	Pest	Distribution	Economic Status	Control Measures Undertaken
Linseed	Linseed gall midge *Dasyneura lini* Barnes	Bhopal, Bihar, Delhi, Hyderabad, Madhya Pradesh, Punjab, Uttar Pradesh.	Mild	1. Spraying with 0.2% DDT. 2. Setting up light traps.
Castor	1. Castor semi-looper *Achoea janata* Lin.	Bihar, Bombay, Delhi, Hyderabad, Madhya Pradesh, Madras, Mysore, Uttar Pradesh.	Mild (Serious in Hyderabad)	1. Spraying with Lead arsenate (1 lb. in 16 gallons of water.) 2. Spraying with 0.16% DDT.
	2. Shoot and capsule borer *Dichocrocis punctiferalis* Guen.	Bombay, Hyderabad, Madhya Pradesh, Mysore, Uttar Pradesh, West Bengal.	Moderate.	1. Dusting with 5% BHC. 2. Spraying with 0.1% to 0·2% DDT or BHC.
	3. Castor hairy caterpillar *Euproctis lunata* Wlk.	Delhi, Madras, Mysore, Uttar Pradesh.	Mode ate.	1. Dusting with 5% BHC 2. Spraying with 0.1% to 0.2% BHC or DDT.
	4. Castor caterpillar *Prodenia litura* Fabr.	Uttar Pradesh.	Moderate	Spraying with 0.1% DDT.
FRUIT TREES Mango	1. Mango hoppers *Idiocerus clypealis* Leth. *I. atkinsoni* Leth. *I. niveosparsus* Leth.	All over India.	Serious	Spraying with 0.25% DDT.

Mango (*contd.*)	2. Mango fruit fly *Dacus ferrugineus* Fabr.	All over India.	Moderate	Spraying with 0.25% DDT on the entire vegetation and hedges in the garden may minimise the damage.
	3. Leaf cutting weevil *Deporaus marginatus* Pasc.	Andhra, Uttar Pradesh.	-do-	Spraying with 0.1% DDT.
	4. Mango psylla *Apsylla cistellata* Buckt.	Bihar, Uttar Pradesh.	-do-	Collection and destruction of galls.
	5. Mango scale insects *Pulvinaria polygonata* Cockerell *Parlatoria pergandii* Comstock *Lepidosaphes gloverii* Packard	-do-	-do-	1. Spraying with Kerosene oil soap emulsion. 2. Spraying with Lime Sulphur.
	6. Mango mealy bug *Drosicha mangiferae* Gr.	Assam, Bihar, Delhi, Hyderabad, Kutch, Madras, Orissa, PEPSU, Punjab, Uttar Pradesh, Vindhya Pradesh.	Serious	1. Putting up sticky bands round main stems. 2. Spraying with Malathion (50% emulsion @ 1 oz. in 4 gallons of water).
	7. Bark eating caterpillar *Indarbela quadrinotata* Wlk.	Bombay, Bihar, Madhya Pradesh, Uttar Pradesh.	Moderate	Fumigating galleries with Petrol or Calcium cyanide paste.

Crop	Pest	Distribution	Economic Status	Control Measures Undertaken
Mango (*contd.*)	8. Mango stem borer *Batocera rufomaculata* De Geer	Bhopal, Bombay, Hyderabad, Mysore.	Serious	Fumigating borer holes with Petrol or Calcium cyanide paste.
	9. Red ant *Oecophylla smaragdina* Fabr.	Andhra, Bihar, Madhya Pradesh, Uttar Pradesh.	Mild	1. Burning and destroying the nest. 2. Spraying with O. 25% BHC.
Citrus	1. Bark eating caterpillar *Indarbela quadrinotata* Wlk.	Bihar, Madhya Bharat, Madhya Pradesh, Madras, Uttar Pradesh, Vindhya Pradesh.	—	As in the case of mango.
	2. Citrus fruit sucking moths *Othreis materna* Lin. *O. fullonia* Cl. *Achoea janata* Lin. *Calpe emarginata* Fabr.	Assam, Bhopal, Bihar, Bombay, Hyderabad, Madhya Bharat, Madhya Pradesh, Madras, Uttar Pradesh.	Serious	Removing larval food plants growing in and around orchards
	3. Citrus psylla *Diaphorina citri* Kuw.	Bihar, Delhi, Himachal Pradesh, Madhya Pradesh, Madras, PEPSU, Punjab, Rajasthan, Uttar Pradesh, Vindhya Pradesh.	Moderate	Spraying with Nicotine sulphate (1:700)

Citrus (*contd.*)	4.	Fluted scale *Icerya purchasi* Mask.	South India.	—	1. Liberating predaceous beetle of *Rodolia* sp. 2. Spraying with 4% Diesel oil emulsion during winter.
	5.	Citrus leaf miner *Phyllocnistis citrella* Sta.	All citrus growing areas of India.	Mild	1. Spraying with 0.25% DDT. 2. Spraying with Nicotine sulphate (1 : 700).
	6.	Lemon butterfly *Papilio demoleus* Lin.	—do—	—do—	Spraying with 0.25% DDT.
	7.	Red ant *Oecophylla smaragdina* Fabr.	All citrus growing areas of India.	Mild	As given under mango.
	8.	Citrus white flies *Dialeurodes citri* Ashm. *Aleurocanthus spiniferus* Quaint. *A. woglumi* Ashby	Bihar, Bombay, Delhi, Madhya Bharat, Uttar Pradesh.	Mild	Spraying with Fish oil Rosin soap.
	9.	Top shoot borer *Chelidonium cinctum* Guenn-Meveville	Coorg, Madras, Mysore.	Moderate	1. Cutting the wilted shoots and destroying. 2. Fumigating the borer holes with Calcium cyanide paste or Petrol.

Crop	Pest	Distribution	Economic Status	Control Measures Undertaken
Citrus (*contd.*)	10. Stem borer *Chloridolum alcmene* T.	Coorg, Madras.	Moderate	1. Cutting the wilted shoots an destroying. 2. Fumigating the borer holes with Calcium cyanide paste or Petrol.
	11. Orange beetle borer *Stromatium barbatum* Fabr.	Assam, Madhya Pradesh, PEPSU.	Moderate	Fumigating the borer holes with Calcium cyanide paste, Petrol, etc.
Apple	1. San Jose Scale *Quadraspidiotus perniciosus* Comstock	Assam, Himachal Pradesh, Jammu & Kashmir, Madras, PEPSU, Punjab, UttarPradesh, West Bengal.	Serious	Spraying with 4% Diesel oil emulsion during winter or 0.03% Diazinon (Basudin).
	2 Woolly aphis *Eriosoma lanigerum* Hausm.	Assam, Himachal Pradesh, Jammu & Kashmir, Madras, Mysore, PEPSU, Punjab, Uttar Pradesh.	Serious	Spraying aerial forms with Fish oil Rosin soap or Nicotine sulphate.
	3. Apple root borer *Dorysthenes hugelii* Redt.	Himachal Pradesh, PEPSU, Punjab, Uttar Pradesh.	Mild	1. Avoiding dry sandy soils for apple plantation. 2. Applying wellrotten manure to apple trees. 3. Mechanical removal of the borers.
	4. Tent caterpillar *Clisiocampa indica* Wlk.	Himachal Pradesh, PEPSU, Punjab, Uttar Pradesh.	Moderate	Spraying with 0.5% DDT

	5. Apple stem borer *Zeuzera* sp.	Himachal Pradesh, PEPSU, Punjab, Uttar Pradesh.	Moderate	Fumigating the bored twigs and branches with Calcium cyanide paste or Petrol.
	6. Apple leaf defoliating and fruit eating beetles *Melolontha nepalensis* Bl. *Adoretus duvauceli* Bl. *Adoretus versutus* Har. *Anomala lineatopennis* Bl. *Anomala polita* Bl. and others	Himachal Pradesh, PEPSU, Punjab, Uttar Pradesh.	Serious	Spraying with 0.25% to 0.5% DDT.
Peach	1. Leaf curling aphis *Anuraphis helichrysi* Kalt.	Himachal Pradesh, Jammu & Kashmir, PEPSU, Punjab, Uttar Pradesh.	Serious	1. Spraying during winter with 0.5% DDT against newly hatched nymphs. 2. Removal of golden rod plants in the neighbourhood of peach trees wherever possible.
	2. Peach leaf scale *Pseudaulacaspis pentagona* Targ.	-do-	Serious	Spraying with Fish oil Rosin soap ½ lb. in 1 gallon.

Crop	Pest	Distribution	Economic Status	Control Measures Undertaken
Peach (*contd.*)	3. San Jose Scale *Quadraspidiotus perniciosus* Comstock	Assam, Himachal Pradesh, Jammu & Kashmir, PEPSU, Punjab, Uttar Pradesh.	Serious	Spraying with 4% Diesel oil emulsion during winter or 0.03% Diazinon (Basudin)
	4. Bark eating caterpillar *Indarbela quadrinotata* Wlk.	Bhopal, Bombay, Madhya Pradesh, Uttar Pradesh.	Moderate	Fumigating the galleries with Calcium cyanide paste or Petrol.
Guava	Fruit flies *Dacus ferrugineus* Fabr. *D. zonatus* Saund.	All over India.	Serious	Removal and destruction of affected fruits.
Pomegranate	1. Anar butterfly *Virachola isocrates* Fabr.	Bhopal, Hyderabad, Madhya Pradesh, Madras, PEPSU, Rajasthan, Uttar Pradesh.	Moderate	1. Bagging of fruits wherever possible. 2. Spraying with 0.25% DDT.
Litchi	1. Litchi leaf curling mite *Eriophyes* sp.	Assam, Bihar, Uttar Pradesh.	Mild	1. Spraying with lime sulphur wash. 2. Dusting with sulphur.
	2. Bark eating caterpillar *Indarbela quadrinotata* Wlk.	Bihar, Madhya Pradesh, Uttar Pradesh.	-do-	Fumigating the galleries with Calcium cyanide paste or Petrol.

Ber	*Ber* fruit fly *Carpomyia vesuviana* Costa.	Throughout India.	Mild	Removing wild *Ber* bushes from the vicinity of grafted *Ber* trees.
Banana	Banana weevils *Cosmopolites sordidus* Germ. *Odioporus longicollis* Oliv.	Assam, Bihar, Bombay, Madras, Uttar Pradesh, West Bengal.	Mild	Discarding infested suckers.
Fig	Fig leaf caterpillar *Phycodes minor* Moore	Uttar Pradesh.	—	Dusting with 5% BHC.
Grapevine	1. Grapevine flea beetle *Scelodonta strigicollis* M.	Bombay, Punjab, South India.	Serious	Spraying with 0.25% DDT.
	2. Grapevine chafer *Adoretus lasiophygus* B. *A. versutus* H.	-do-	-do-	-do-
	3. Vine girdler beetle *Sthenias grisator* F.	Bombay, Punjab, South India.	Moderate	Cutting the attacked branches below the girdling point and burning.

Crop	Pest	Distribution	Economic Status	Control Measures Undertaken
Grapevine (*contd.*)	4. Grape thrips *Rhipiphorothrips cruentatus* M.	Bombay, Punjab, South India.	Moderate	Spraying with Nicotine sulphate 1 :800.
	5. Scales *Aspidiotus cydoniae* C. *A. lataniae* S.	-do-	-do-	Spraying with Fish oil Rosin soap (2 ounces per gallon of water).
Melons	Fruit flies *Dacus cucurbitae* Coq. *D. ciliatus* Loew.	Throughout India.		Removing and destroying infested fruits at regular intervals.
Jack Fruit	1. Stem borer *Margaronia caesalis* W.	Assam, Bengal, Bihar, Bombay, Delhi, Madhya Pradesh, Orissa, South India, Uttar Pradesh.	Serious	Fumigating borer holes with Petrol or Calcium cyanide paste.
	2. Jack bud weevil *Ochyromera artocarpi* M.	-do-	Moderate	1. Spraying with 0.25% DDT. 2. Destroying infested and fallen buds and fruits.

VEGETABLES Sweet Potato	1. Sweet potato weevil *Cylas formicarius* Fabr.	Madras, Mysore, Orissa, Uttar Pradesh.	Moderate	Keeping tubers well covered in the soil to avoid direct egg laying.
Potato	1. Epilachna beetles *Epilachna vigintioctopunctata* Fabr. *E. dodecastigma* Muls. *E. ocellata* Redt.	Assam, Bhopal, Bombay, Himachal Pradesh, Madras, Mysore, PEPSU, Punjab, Uttar Pradesh, West Bengal.	-do-	Spraying with 0.25% DDT.
	2. Cut worms *Agrotis* spp. *Euxoa segetis* Schiff.	Ajmer, Assam, Bihar, Bombay, Delhi, Himachal Pradesh, Madhya Bharat, Orissa, PEPSU, Punjab, South India, Uttar Pradesh, Vindhya Pradesh, West Bengal.	Moderate	Dusting with 3% to 5% BHC around the base of plants.
	3. Jassid *Empoasca devastans* Dist.	Assam, Bhopal, Bihar, Bombay, Madhya Bharat, Madras, Mysore, Orissa, PEPSU, Punjab, Uttar Pradesh, West Bengal.	Serious	Spraying with 0.1% DDT.
	4. Mole cricket *Gryllotalpa africana* Palisot De Beanvois	All over India.	Serious in West Bengal	Mixing 4% BHC dust in soil before sowing.

Crop	Pest	Distribution	Economic Status	Control Measures Undertaken
Potato (*contd.*)	5. Potato eelworm *Heterodera marioni* Goodey	Himachal Pradesh.	Serious in some areas	1. Use of nematode free potato tuber for sowing. 2. Rotation with nonsusceptible crops.
Brinjal	1. Lace wing bug *Urentius echinus* Dist.	Throughout the plains of India.	Moderate	1. Dusting with 5% BHC. 2. Spraying with 0·2% BHC or 0·004% Pyrocolloid.
	2. Stem borer *Euzophera perticella* Rag.	-do-	Serious	Removing affected shoots followed by spraying with 0.25% DDT.
	3. Fruit and shoot borer *Leucinodes orbonalis* Guen.	-do-	Serious	1. Removing infested shoots, fruits and fallen leaves. 2. Spraying with 0.25% DDT.
	4. Epilachna beetles *Epilachna vigintioctopunctata* Fabr. *E. dodecastigma* Muls.	Bhopal, Bihar, Bombay, Delhi, Hyderabad, Madras, Mysore, PEPSU, Punjab, Rajasthan, Travancore-Cochin, Uttar Pradesh, West Bengal.	Serious	1. Dusting with 5% BHC. 2. Spraying with 0.25% DDT.
	5. Mealy bug *Phenacoccus insolitus* Gr.	Bihar, Madras, Mysore, Punjab, Uttar Pradesh, West Bengal.	Mild	Spraying with 50% Malathion (1 oz. in 4 gallons of water).
	6. Jassid *Empoasca devastans* Dist.	Delhi, Madras, Orissa, PEPSU, Punjab, Rajasthan, Uttar Pradesh, Vindhya Pradesh.	Moderate	Spraying with 0.16% DDT.

	7. Root gall eelworm *Heterodera marioni* Goodey	Bihar, Delhi, Uttar Pradesh.	Mild	Rotation with nonsusceptible crops.
Cabbage, Cauli-flower & Knol-khol	1. Cabbage aphis *Brevicoryne brassicae* Lin.	All over India.	Serious	1. Spraying with Nicotine sulphate 1 : 800. 2. Spraying with Pyrocolloid emulsion (1 : 800).
	2. Diamond back moth *Plutella maculipennis* Curt.	-do-	Serious	1. Dusting with Pyrodust. 2. Spraying with 0·16% DDT.
Turnip Radish & Other Cruci-ferous Vegetable crops	1. Mustard sawfly *Athalia proxima* Klug.	-do-	Moderate	Dusting with 5% BHC or DDT.
	2. Painted bug *Bagrada cruciferarum* Kirk.	-do-	-do-	1. Spraying with 0.1% DDT. 2. Dusting with 0.5% Rotenone 3. Dusting with 5% BHC.
	3. Flea beetle *Phyllotreta cruciferae* Goez.	-do-	-do-	Spraying with 0.25% DDT.
	4. Mustard aphis *Lipaphis erysimi* Davis	All over India.	Moderate	Spraying with Nicotine sulphate (1 : 800).

Crop	Pest	Distribution	Economic Status	Control Measures Undertaken
Lady's finger	1. Spotted boll worms *Earias insulana* Boisd. *E. fabia* Stoll.	All over India	Moderate	1. Removing and destroying infested fruits. 2. Spraying with 0.25% DDT.
	2. Red cotton bug *Dysdercus cingulatus* Fabr.	Bihar, Madhya Pradesh, Orissa, Uttar Pradesh.	Moderate	Dusting with 5% BHC.
	3. Jassid *Empoasca devastans* Dist.	Delhi, Madras, Orissa, PEPSU, Punjab, Rajasthan, Uttar Pradesh.	-do-	Spraying with 0.16% DDT.
	4. Banded blister beetles *Mylabris phalerata* Pall. *M. pustulata* Thunb.	Uttar Pradesh.	Serious	Hand netting of beetles.
Tomato	1. Fruit borer *Heliothis armigera* Hubn.	Assam, Bhopal, Madhya Pradesh, Madras, PEPSU.	Mild	Removal and destruction of affected fruits.
	2. Root gall eelworm *Heterodera marioni* Goodey	Bihar, Delhi, Uttar Pradesh.	Serious	Treating soil with DD fumigant.

Beans	Bean aphis *Aphis craccivora* Koch.	All over India.	Mild	1. Spraying with Nicotine sulphate (1 : 800). 2. Spraying with 0.004% Pyrocolloid.
Chillies	Chilli thrips *Scirtothrips dorsalis* Hood	Bhopal, Bihar, Bombay, Coorg, Delhi, Madhya Pradesh, Madras, Mysore, Orissa, Punjab, Vindhya Pradesh	Serious	1. Spraying with 0.1% BHC. 2. Dusting with 5% BHC.
Onion	Onion thrips *Thrips tabaci* Lind.	Andhra, Assam, Bihar, Madras, Mysore, PEPSU.	Moderate	1. Spraying with 0.1% BHC. 2. Dusting with 5% BHC.
Cucurbits	1. Red pumpkin beetle *Aulacophora foveicollis* Lucas *A. intermedia* Jac.	All over India.	Serious	Dusting with 2.5% BHC or DDT.
	2. Banded blister beetle *Mylabris pustulata* Thunb.	-do-	Moderate	Hand netting of beetles.

Crop		Pest	Distribution	Economic Status	Control Measures Undertaken
Cucurbits (*contd.*)	3.	Fruit flies *Dacus cucurbitae* Coq. *D. ciliatus* Loew.	All over India.	Serious	Collecting and destroying the affected fruits.
	4.	Stink bugs *Aspongopus janus* F. *A. brunneus* Thunb.	Bihar, Punjab, PEPSU, Uttar Pradesh, West Bengal.	-do-	Dusting with 2.5% BHC.
Singhara		Singhara beetle *Galerucella birmanica* Jac.	Bihar, Delhi, Madhya Bharat, Madhya Pradesh, PEPSU, Punjab, Rajasthan, Uttar Pradesh.	-do-	Dusting with 5% BHC.
PLANTATION CROPS					
Tea	1.	Tea mosquitoes *Helopeltis antonii* Sign. *H. febriculosa* Ber. *H. theivora* Waterhouse	Assam, South India, West Bengal.	-do-	1. Dusting with 5% Derris. 2. Spraying with 0.1% DDT at least 3 weeks before pickings. 3. Collecting bugs by handnets and killing by dropping in kerosenised water.
	2.	Red spider (Tea red mite) *Tetranychus bioculatus* Wood-Mason	Assam, South India, West Bengal.	Moderate	Dusting with Sulphur.

	3. The red slug				
	Heterusia cingala Moore	Assam, West Bengal.	Serious	Hand-picking of caterpillars and cocoons. Sweeping fallen leaves and burning them.
	Clania crameri West.	Assam.	Serious	Hand picking.
	4. Nematodes			
	Heterodera radicicola Muell.	Assam, Madras, West Bengal.	Serious	Treating soil with DD fumigant.
	Buzura suppressaria G.	Assam, South India.	Moderate	-do-
Coffee	1. Coffee stem borer *Mylotrechus quadripes* Chevr.	South India.	Moderate	1. Spraying with 0.25% DDT after picking leaves. 2. Stem scrubbing or swabbing with 5% BHC.
	2. Cutworm *Agrotis segetum* Schiff.	-do-	Moderate	1. Raking the soil and collecting the larvae. 2. Dusting soil with 5% BHC.
	3. Coffee grasshopper *Aularches miliaris* D.	-do-	Mild	Dusting with 5% BHC.
	4. Green bug *Coccus viridis* Gr.	Mysore.	Serious	Spraying with 0.25% DDT.

Crop	Pest	Distribution	Economic Status	Control Measures Undertaken
Coffee (*contd.*)	5. Red bug *Saissetia hemisphoerica* Turg.	Mysore.	Serious	Spraying with 0.25% DDT.
	6. Red borer *Zeuzera coffeae* Niet.	Mysore and other coffee districts of South India.	Mild	Pruning and removing affected branches.
Coconut	1. Black headed caterpillar *Nephantis serinopa* Meyr.	Andhra, Bombay, Madras, Orissa, Travancore-Cochin, West Bengal.	Moderate	1. Cutting out infested fronds. 2. Spraying with 0.16% DDT.
	2. Rhinoceros beetle *Oryctes rhinoceros* Lin.	Andaman-Nicobar Islands, Andhra, Assam, Bombay, Madras, Orissa, Hyderabad, Mysore. Saurashtra, Travancore-Cochin, West Bengal.	Serious	1. Hooking out beetles from affected crowns. 2. Dusting or spraying BHC on breeding pits. 3. Filling the empty holes with sand mixed with 5% BHC.
	3. Red palm weevil *Rhynchophorus ferrugineus* Fabr.	Bhopal, Bombay, Madras, Orissa, Travancore-Cochin.	Moderate	1. Closing the holes with cement plaster to prevent entry of weevils in stem for egg laying. 2. Injection of 1% Pyronone in the holes after cleaning.
	4. Cockchafer beetle *Leucopholis coneophora* Burm.	Bombay, Madras, Travancore-Cochin.	Moderate	Dusting or spraying BHC on breeding places.

Arecanut	Scales *Chionaspis dilatata* G. *Pinnaspis aspidistroe* S.	South India.	Mild	Spraying with Fish oil Rosin soap (2 ounces per gallon of water).
Betelvine	1. Betelvine bug *Disphinctus politus* W.	Madhya Pradesh, South India, Uttar Pradesh, Vindhya Pradesh.	-do-	Dusting with Pyrodust 20-25 pounds per acre.
	2. Mealy bug *Lepidosaphes & Pseudococcus* spp.	-do-	-do-	Spraying with 50% Malathion emulsion (1 ounce in 4 gallons of water).
NARCOTIC DRUGS				
Tobacco	1. Tobacco caterpillar *Prodenia litura* Fabr.	All over India.	Moderate	Dusting with 5% BHC.
	2. Tobacco grasshopper *Atractomorpha crenulata* Fabr.	-do-	Mild	-do-
	3. Cutworms *Agrotis ypsilon* Rott. *A. flammatra* Schiff.	Delhi, Madhya Pradesh, Madras, Uttar Pradesh.	Mild	Dusting the soil around base of plants with 5% DDT.

Crop	Pest	Distribution	Economic Status	Control Measures Undertaken
Tobacco (*contd.*)	4. Tobacco stem borer *Gnorimoschema heliopa* Lower	South India.	Mild	1. Weeding out seedlings with gall like swellings. 2. Spraying nursery beds with Calcium arsenate.
Poppy	1. Poppy weevil *Myllocerus* sp.	Punjab and Uttar Pradesh.	Mild	Dusting with 5% BHC.
	2. Cutworms *Agrotis ypsilon* Rott. *A. spinifera* Hubn. *Heliothis armigera* Hubn.	South India.	Mild	Dusting with 5% DDT around base of plants.
FODDER CROPS				
Lucerne & Berseem	Lucerne caterpillar *Laphygma exigua* Hubn.	Bihar, Bombay, Delhi, Madhya Pradesh, PEPSU, Punjab, Uttar Pradesh, West Bengal.	Mild	1. Dusting with 5% BHC. 2. Close cutting of the heavily infested crop followed by heavy irrigation.
SPICE CROPS				
Pepper	1. Mussel scale of pepper *Mytilaspis piperis* Green	Hilly districts of South India.	Serious	Spraying with Fish oil Rosin soap (2 ozs. per gallon of water).

	2. Flea beetle *Longitarsus nigripennis* Mots.	North Malabar.	Moderate	Hoeing the soil around the vines to destroy the pupae.
	3. Pepper mealy bug *Pseudococcus virgatus* Ckll.	South India.	Serious	Spraying with 0.08% Malathion (1 oz. of 50% emulsion in 4 gals. water)
Turmeric	1. Stem borer *Dichocrocis punctiferalis* Guen.	-do-	Mil	Destruction of affected shoots,
	2- White lacewing bug *Stephanitis typicus* Dist.	-do-	-do-	1. Spraying with Rosin compound. 2. Dusting with 5% BHC.
	3. Thrips *Panchaetothrips indica* Bagn.	-do-	-do-	Dusting with 5% BHC.
	4. Turmeric skipper *Udaspes folus* Cr.	Bombay, Punjab, Madras.	Serious	1. Picking of caterpillars. 2. Spraying with 0.25% DDT.

Crop	Pest	Distribution	Economic Status	Control Measures Undertaken
Turmeric (*contd.*)	Turmeric skipper (*contd.*)			
	Diacrisia obliqua Wlk.	West Begal, Bihar.	Mild	1. Hand-picking young larvae before dispersal. 2. Dusting with 5% to 10% BHC.
Ginger	1. Ginger borer *Dichocrocis punctiferalis* Guen.	South India.	-do	1. Removal of affected shoots. 2. Spraying with 0.25% DDT.
	2. Turmeric skipper *Udaspes folus* Cr.	South India.	Serious	As under turmeric.
Cummin & Coriander.	1. Onion caterpillar *Laphygma exigua* Hb.	-do-	Mild	Dusting with 5% DDT.
	2. Flower head bug *Agonoscelis nubila* F.	-do-	-do-	-do-
	3. Aphid *Hyalopterus arundinis* F.	-do-	-do-	Spraying with Nicotine sulphate (1 : 800).

STORAGE PESTS				
Rice, Wheat Barley, Maize etc.	1. Rice weevil *Sitophilus oryza* Lin.	All over India.	Serious	1. Fumigating with Methyl bromide or Ethylene dichloride and Carbon tetrachloride mixture (EDCT). 2. Light dusting with 5% BHC on grain bags.
	2. Khapra beetle *Trogoderma granaria* Evert.	Northern India	-do-	-do-
	3. Lesser grain borer *Rhizopertha dominica* Fabr.	All over India.	-do-	-do-
	4. Rice moth *Corcyra cephalonica* Stn.	-do-	-do-	-do-
	5. Angoumois grain moth *Sitotroga cerealella* Oliv.	-do-	-do-	-do-

Crops		Pest	Distribuion	Economic Status	Control Measures Undertaken
Wheat and Rice Flour	1.	Rust red flour beetle *Tribolium castaneum* Herbst.	All over India.	Serious	Fumigation with EDCT mixture or Methyl bromide
	2.	Angoumois grain moth *Sitotroga cerealella* Oliv.	-do-	-do-	-do-
Gram, Bean Pea, etc.		Pulse beetles *Pachymerus chinensis* Lin. *Bruchus analis* Fabr. *Laria affinis* Frol.	-do-	-do-	-do-
Cashewnut & Raisins	1.	Almond moth *Ephestia cautella* Wlk.	-do-	Mild	Fumigation with Methyl bromide.
	2.	Saw-toothed beetle *Oryzaephilus surinamensis* Lin.	-do-	-do-	-do-

Potato	Potato tuber moth *Gnorimoschema operculella* Zell.	-do-	Moderate	1. Dusting seed potatoes with 5% DDT. 2. Fumigation with Methyl bromide.
Groundnut	1. Almond moth *Ephestia cautella* Wlk.	-do-	-do-	1. Fumigating with Methyl bromide. 2. Spraying godown with 0.25% DDT before storage.
	2. Rice moth *Corcyra caphalonica* Staint.	-do-	-do-	-do-
	3. Rust red flour beetle *Tribolium castaneum* Herbst.	-do-	Serious	1. Fumigating with Methyl bromide. 2. Spraying godown with 0.25% DDT before storage
	4. Saw-toothed beetle *Oryzaephilus surinamensis* Lin.	-do-	Mild	-do-
	5. Copra bug *Necrobia rufipes* Degeer.	-do-	-do-	1. Fumigating Methyl bromide 2. Spraying godown with 0.25% DDT before storage.

Crop	Pest	Distribution	Economic Status	Control Measures Undertaken
Groundnut (*contd.*)	6. Dried fruit beetle *Carpophilus dimidiatus* F.	Throughout India	Mild	1. Fumigating with Methyl bromide. 2. Spraying godown with 0.25% DDT before storage.
	PESTS OTHER THAN INSECTS AND MITES.			
	1. Rats	Throughout India.	Serious	1. Baiting with Strychnine hydrochloride or Barium carbonate, or Zinc phosphide or Warfarin. 2. Fumigating burrows with Calcium cyanide dust.
	2. Jackals	All States except Himachal Pradesh, Kutch, Madhya Bharat, Saurashtra.	Serious	Baiting with Strychnine hydrochloride in meat.
	3. Monkeys	All States except Ajmer, Hyderabad, Travancore-Cochin.	Serious	1. Shooting 2. Trapping
	4. Rabbits	All over the plains.	Mild	Nil
	5. Squirrels	Throughout India.	Moderate	Nil

6. Porcupines	Throughout India except in hilly areas at high altitudes.	Mild	Fumigating burrows with Calcium cyanide dust.
7. Flying Foxes	Throughout fruit growing areas in India.	Moderate	Shooting,
8. Wild Boars	All States with forests and vast thick grass lands.	Serious	Shooting,
9. Blue Bulls	All States with forests and vast thick grass lands.	Mild	Shooting.
10. Elephants	Assam, Coorg, Mysore and Travancore-Cochin.	Mild	
11. Deer & Antelopes	Andhra, Bombay, Kutch, PEPSU, Punjab, Rajasthan, Uttar Pradesh, Vindaya Pradesh.	Serious	Shooting.
12. Wild Cattle	PEPSU, Uttar Pradesh, Madhya Pradesh.	Moderate	Nil
13. Birds (Parrots, Sparrows, Pigeons, etc.)	Throughout India.	Serious	Nil
14. Tortoise	Delhi, Uttar Pradesh.	Mild	Nil
15. Crabs	Bombay, West Bengal, Hyderabad.	Mild	Nil

Crop	Pest	Distribution	Economic Status	Control Measures Undertaken
	16. Snails & Slugs	Uttar Pradesh, Bombay, Assam.	Mild	Nil
	17. Millipedes	Assam, West Bengal.	Mild	Nil
	18. Earth-worms	Himachal Pradesh.	Mild	Nil

Plant Diseases and Phanerogamic Parasites of Agricultural Importance in India

Crop	Disease and Causal Organism	Distribution	Economic status	Control measures	Remarks
CEREALS					
Paddy	1. Foot rot and seedling blight (*Fusarium moniliforme* Sheldon)	Andhra, Assam, Bihar, Coorg, Himachal Pradesh, Hyderabad, Madhya Pradesh, Madras, Orissa, Tripura, Uttar Pradesh, West Bengal.	Fairly severe in some areas.	1. Seed treatment with organo-mercurial compounds. 2. Destruction of stubbles of infected crop.	Particularly severe in Madras and Andhra.
	2. Seedling blight, leaf spot and ear-blight (*Helminthosporium oryzae* Breda de Hann)	Throughout India	Very severe in humid areas, upto 50-90% loss in yield has been recorded in Bengal. In 1942-43, the disease was responsible for the Bengal famine.	1. Seed treatment with organo-mercurial compounds. 2. Spraying nurseries with Bordeaux mixture (1%) or other copper fungicides. 3. Use of resistant varieties. 4. Burning of straw and stubbles of diseased crop.	Particularly severe in West Bengal and Assam.

Crop	Disease and Causal Organism	Distribution	Economic status	Control measures	Remarks
Paddy (*contd.*)	3. Blast (*Piricularia oryzae* Cav.)	Andhra, Assam, Bihar, Bombay, Coorg, Hyderabad, Madhya Pradesh, Madras, Mysore, Orissa, Punjab, Travancore-Cochin, Uttar Pradesh, Vindhya Pradesh, West Bengal.	In severe epidemics there may be almost 100% loss.	As above. Dusting with fine sulphur can also be resorted to.	Particularly severe in Madras, Mysore, Andhra, Coorg, and Bombay.
	4. Bunt (*Neovossia horrida* (Tak.) Padwick & Azmatullah Khan)	Assam, Bihar, Bombay, Madras, Orissa, Uttar Pradesh, West Bengal. Probably also in Madhya Pradesh and Mysore.	Usually does slight damage, but may cause a loss of 2-5%.	No satisfactory control measures known.	
	5. Leaf smut (*Entyloma oryzae* Syd.)	Bihar, Bombay, Madhya Bharat, Madhya Pradesh, Orissa, Punjab, Uttar Pradesh, West Bengal.	Usually does slight damage.	-do-	The disease was recently recorded in a severe form at Karnal (Punjab) and in Madhya Bharat.
	6. Stem rot (*Sclerotium oryzae* Cat.)	Throughout India	Fairly severe in some areas and may cause upto 50-70% loss in epidemic years.	1. Marking out areas containing diseased plants before harvesting, and their eradication. 2. Draining away the water and allowing the soil to bake before irrigating again. 3. Use of resistant varieties.	

Wheat	1. Black rust (*Puccinia graminis tritici* Pers.), Brown rust (*Puccinia triticina* Erikss.), and Yellow rust (*Puccinia glumarum* (Schm.) Erikss. & Henn.)	-do-	Usually 7-8% loss, may be caused, which may go upto 80% in epidemic years.	1. Use of resistant varieties. 2. Protecting the crop (at least the seed-crop) by sulphur dusting.	Black rust is most destructive in peninsular India.
	2. Loose smut (*Ustilago tritici* (Pers.) Rostr.)	-do-	Usually 1–5% loss may be caused which may go upto 15% in epidemics.	1. Seed-treatment by the solar-heat method. 2. Roguing of affected ear-heads. 3. Use of resistant varieties.	Particularly serious in Punjab, Delhi, western Uttar Pradesh, Bombay.
	3. Yellowing-rot (*Corynebacterium tritici* (Hutch.) Bergey *et al*) and Earcockle (*Anguillulina tritici*)	Ajmer, Delhi, Punjab, PEPSU, Rajasthan, Uttar Pradesh.	1-2% loss on an average. Losses exceeding 50% have been observed in individual fields.	1. Removal of galls from seed by flotation method. 2. Eradication of affected ear-heads.	Particularly serious in Delhi, Punjab and western districts of Uttar Pradesh.
	4. Foot rot (*Helminthosporium sativum* P. K. & B.)	Bombay, Madhya Bharat, Madhya Pradesh, Punjab, Uttar Pradesh, West Bengal.	Normal average loss 2%, but upto 10% in epidemics.	Seed-treatment with organo-mercurial compounds.	Particularly serious in humid areas, specially in Madhya Pradesh.

Crop	Disease and Causal Organism	Distribution	Economic status	Control measures	Remarks
Wheat (*contd.*)	5. Bunts (*Tilletia caries* (DC.) Tul. and *T. foetida* (Wallr.) Liro)	Himachal Pradesh, Kashmir, PEPSU, Punjab, Uttar Pradesh.	Usually upto 10% loss may be caused which may go upto 80% in epidemic years.	1. Seed-treatment with organo-mercurial. compounds 2. Eradication of affected ears.	Prevalent in hill districts (3000 feet or above).
	6. Karnal bunt (*Neovossia indica* (Mitra) Mundkur)	Delhi, Punjab, Uttar-Pradesh, PEPSU.	Incidence usually slight, upto 33% in epidemics.	No satisfactory control measures known.	
	7. Flag smut (*Urocystis tritici* Korn.)	Ajmer, Delhi, Punjab, PEPSU, Rajasthan, Uttar Pradesh, Possibly also in Madhya Pradesh, Vindhya Pradesh.	Usually not serious	1. Seed-treatment with organo-mercurial compounds. 2. Use of resistant varieties.	
Barley	1. Black rust (*Puccinia graminis tritici*), and yellow rust (*Puccinia glumarum*)	Throughout India	Same as under wheat.	Same as under wheat	Yellow rust is very common.
	2. Covered smut (*Ustilago hordei* (Pers.) Lagerh.)	-do-	Usually 2-5% loss, upto 30% in some epidemic years.	1. Seed-treatment with organo-mercurial compounds. 2. Roguing of smutted heads.	

	3. Loose smut (*Ustilago nuda* (Jens.) Rostr.)	-do-	Average loss 1%	1. Seed-treatment by solar-heat method. 2. Roguing of affected earheads.	
	4. Stripe disease (*Helminthosporium gramineum.* Rabenh.)	Bihar, Bombay, Rajasthan, Uttar Pradesh, West Bengal.	Incidence usually 2-5%, 20-30% in some epidemic years.	Seed treatment with organo-mercurial compounds.	
	5. Foot rot and seedling blight (*Helminthosporium sativum* P. K. & B. and *H. teres* Sacc.)	In most of the barley growing tracts of northern India.	Serious in some areas	Seed treatment with organo-mercurial compounds.	Particularly severe in parts of Bihar and Uttar-Pradesh.
Oats	1. Black rust (*Puccinia graminis avenae* Erikss. and P. Henn.)	Throughout India	Serious in some years	Use of resistant varieties.	
	2. Covered smut (*Ustilago kolleri* Wille)	-do-	Fairly common, may cause 2—5% loss.	1. Seed-treatment with organo-mercurial compounds. 2. Roguing of affected earheads.	
	3. Loose smut (*Ustilago avenae* (Pers.) Rostr.)	-do-	Usually not serious	-do-	

Crop	Disease and Causal Organism	Distribution	Economic status	Control measures	Remarks
Jowar	1. Grain smut (*Sphacelotheca sorghi* (Link.) Clinton, and Loose smut (*S. cruenta* (Kuhn) Potter)	Throughout India	Fairly severe, may cause a loss of upto 60% in epidemics.	1. Seed-treatment with organomercurial compounds, copper carbonate or sulphur dust.	Particularly severe in Bombay, Madhya-Pradesh, Madras, Andhra and Hyderabad.
	2. Head smut (*Sphacelotheca reiliana* (Kuhn) Clint.)	In several parts of India	Usually not serious.	Destruction of smutted ears. Seed-treatment is not effective.	
	3. Long smut (*Tolyposporium filiferum* Busse)	-do-	-do-	No satisfactory control measures known.	
	4. Downy mildew (*Sclersopora sorghi* Weston and Uppal)	-do-	Incidence usually 2-5%, upto 60% in epidemics.	No satisfactory control measures known.	
	5. Rust (*Puccinia purpurea* (Cooke)	-do-	Serious in certain years.	Use of resistant varieties.	Serious in south India
	6. Phanerogamic parasite (*Striga* spp.)	-do-	Serious in some localities.	1. Eradication of the parasite before fruiting. 2. Spraying of 2, 4-D formulations. 3. Use of resistant varieties.	Serious in Bombay

Italian Millet	1. Smut (*Ustilago crameri* Korn.)	Andhra, Bombay, Hyderabad, Madhya-Pradesh, Madras, Mysore.	Incidence usually 2-5%, upto 60% in epidemics.	1. Seed-treatment with organo-mercurial compounds, copper carbonate or sulphur dust. 2. Destruction of smutted ears.	
Ragi	1. Leaf blight and foot-rot (*Helminthosporium nodulosum* Berk. and Curt.)	Throughout India	No definite information available.	Seed-treatment with organo-mercurial compounds.	
	2. Blast (*Piricularia eleusine* Cav.)	Andhra, Madras, Mysore, Orissa.	Serious in some localities.	Use of resistant varieties.	Serious in south India.
Maize	1. Leaf blight (*Helminthosporium turcicum* Pass.)	-do-	Serious in epidemic years.	Seed-treatment with organo-mercurial compounds.	
	2. Downy mildew (*Sclerospora philippinensis* Weston and *S. sorghi* Weston and Uppal)	-do-	-do-	Spraying with Bordeaux mixture or other copper fungicides for the prevention of secondary infection.	Serious in Bihar

Crop	Disease and Causal Organism	Distribution	Economic status	Control measures	Remarks
Maize (*contd.*)	3. Smut (*Ustilago maydis* (DC.) Corda)	West Bengal and Kashmir	A disease of minor importance	No satisfactory control measures known.	Occurs sporadically in the hills
Bajra	1. Green-ear disease (*Sclerospora graminicola* (Sacc.) Schroter)	Throughout India	Incidence usually 2-5%, upto 60% in epidemics.	No satisfactory control measures known.	
	2. Smut (*Tolyposporium penicillariae* Bref.)	-do-	Usually does slight damage.	No satisfactory control measures known.	
	3. Phanerogamic parasite (*Striga* spp.)	Rajasthan, and perhaps elsewhere also.	Usually not serious	1. Eradication of the parasite before flowering. 2. Spraying of 2, 4-D formulation.	Reported to be serious in parts of Rajasthan.
PULSES Black and Green Gram	Leaf spots (*Cercospora* spp.)	Assam, Bihar, Bombay, Madras, Kashmir, Madhya Pradesh, Uttar-Pradesh	Disease in varying intensity present everywhere.	Spraying with Bordeaux mixture (4:4:50) or other copper fungicides.	Serious in Assam
Gram	1. Wilt (*Fusarium orthoceras* Appel and Wollenw.)	Through out India	Incidence usually 2-5%, and in severe cases 30-40%.	1. Delayed sowing (by middle of October). 2. Eradiction of affected plants.	

				3. Use of resistant varieties.	
2. Wilt(Physiological)	Punjab, PEPSU.	Average loss approximately 10%.	1. Conservation of the soil moisture and loosening of subsoil upto a depth of about 1 foot during monsoon.		
			2. Delayed sowing, beginning about the 2nd week of October and continued upto about the middle of the last week.		
			3. Avoidance of broadcast method of sowing.		
			4. Sowing of suitable varieties.		
			5. Irrigation during the early stage of growth of the crop.		
3. Rust (*Uromyces ciceris-arietini* (Greg.) Jacz. and Boyer)	Bihar, Bombay, Delhi, Punjab, Uttar Pradesh, West Bengal.	Appears usually late in the season every year.	The disease is usually not serious and no control measures are necessary.	Serious in certain years when the disease appears early.	

Crop	Disease and Causal Organism	Distribution	Economic status	Control measures	Remarks
Gram (*contd.*)	4. Blight (*Mycosphaerella rabie* Kovachevski)	Punjab, PEPSU.	Serious	1. Removal of diseased plants and their destruction by burning. 2. Use of healthy seed for planting. 3. Use of resistant varieties.	
Pigeon pea	Wilt (*Fusarium udum* Butler)	Throughout India	Incidence usually 1-2%, upto 60% in epidemics	1. Roguing of diseased plants. 2. Mixed cropping with jowar. 3. Use of resistant varieties. 4. Long rotation with non-susceptible crops.	
Pea	1. Powdery mildew (*Erysiphe polygoni* DC.)	-do-	Usually not serious	Dusting the crop with fine sulphur	
	2. Downy mildew (*Peronospora viciae* (Berk) Casp.)	-do-	—	Spraying the crop with Bordeaux mixture or other copper fungicides.	
	3. Rust (*Uromyces fabae* (Pers.) de Bary)	Several parts of India	Usually not serious	Dusting with fine sulphur.	Serious in certain years.

Sugarcane	1. Red rot (*Physalospora tucumanensis* Speg.)	Throughout India	Loss usually 2-5%, upto 2/3 (67%) loss in epidemic years.	1. Use of healthy setts for planting 2. Avoidance of ratooning of diseased crop. 3. Roguing and destruction of affected shoots and clumps. 4. Use of resistant varieties.	Serious in Uttar Pradesh, Bihar and Punjab
	2. Smut (*Ustilago scitaminea* Syd.)	-do-	Loss usually 2-5%, upto 2/3 loss (67%) in epidemics.	1. Use of healthy setts for planting. 2. Avoidance of ratooning of diseased crop. 3. Roguing and destruction of smutted shoots and clumps. 4. Use of resistant varieties.	
	3. Wilt (*Cephalosporium sacchari* Butl.)	Bihar, Bombay, Punjab, Uttar Pradesh.	Serious in some areas	1. Eradication of diseased clumps. 2. Rotation of crops, avoiding replanting of sugarcane in affected fields for three years. 3. Saving the crop from damage by termites, borers and other pests. 4. Use of resistant varieties.	

Crop	Disease and Causal Organism	Distribution	Economic status	Control measures	Remarks
Sugarcane (*contd.*)	4. Rust (*Puccinia kuehnii* (Krueg.) Butler)	Bombay, Hyderabad, Madras, Uttar Pradesh	Serious on the varieties Co.475 in Bombay, Co. 876 and Co-928 in Madras, Co.475 and 876 in Hyderabad and Co.S.510 in Uttar Pradesh.	Use of resistant varieties.	Serious only on certain varieties.
	5. Mosaic (*Virus*)	Throughout India	Usually not serious	1. Use of resistant varieties. 2. Sett selection	
FIBRE CROPS					
Cotton	1. Wilt (*Fusarium vasinfectum* Atk.)	Throughout India	Incidence usually less than 5%, 40-60% in some areas.	1. Use of resistant varieties. 2. Early sowing 3. Sowing *desi* cotton mixed with American cotton.	A disease of minor importance in north India.
	2. Root rot (*Macrophomina phaseoli* (Maubl.)Ashby and *Corticium solani* (Prill and Delacr.) Bourd. and Galz.)	Throughout India	Average loss of 2-5%, and upto 60% in some areas.	1. Early or late sowing 2. Mixed cropping with '*moth*' (*Phaseolus aconitifolius*) or jowar. 3. Use of resistant varieties.	

	3. Anthracnose (*Colletotrichum indicum* Dastur)	Andhra, Hyderabad, Madhya Pradesh, Madras, Mysore, West Bengal.	Usually not serious, upto 10% loss in some areas.	Seed-treatment with organo-mercurial compounds.	
	4. Black-arm (*Xanthomonas malvacearum* (Smith) Dowson)	In several parts of India	Serious in some seasons	Seed-treatment with organo-mercurial compounds.	Serious in parts of Madras
Jute	Stem rot (*Macrophomina phaseoli* (Maubl.) Ashby)	Assam, Orissa, Tripura, West Bengal.	-do-	-do-	
Rosella-hemp 'Mesta'	Stem rot (*Sclerotinia sclerotiorum* (Lib.) de Bary)	In most areas	Not known	Hand-picking the sclerotia from infected seed prior to sowing.	Serious in Bihar
OIL SEEDS					
Castor	1. Rust (*Melampsorella ricini* (Biv.) de Toni)	Andhra, Bombay, Hyderabad, Madras, Madhya Pradesh, Mysore.	Severe in some localities	Dusting with fine sulphur (1:300 mesh).	Serious in Hyderabad
	2. Seedling blight (*Phytophthora parasitica* Dastur)	-do-	Severe in some places	Sparying with Bordeaux mixture or other copper fungicides.	Mainly a seedling disease
Mustard and Duan (*Eruca sativa*)	1. Pod blight (*Alternaria brassicae* (Berk.) Sacc.)	Throughout India	Severe in some places on yellow mustard	Spraying with Bordeaux mixture or other copper fungicides.	Serious in Uttar Pradesh, specially when winter rains are heavy.

Crop	Disease and Causal Organism	Distribution	Economic status	Control measures	Remarks
Mustard and Duan (*Eruca sativa*) (*contd.*)	2. Downy-mildew (*Peronospora parasitica* (Fr.) Tul.)	-do-	Usually not serious	-do-	Serious on *Eruca sativa*
	3. White rust (*Cystopus candidus* (Pers.) de Bary)	-do-	-do-	Not definitely known	-do-
	4. Root rot (*Sclerotinia sclerotiorum* (Lib.) de Bary)	In several parts of India	-do-	-do-	-do-
Linseed	1. Rust (*Melampsora lini* (Pers.) Lev.)	Throughout India	Severe	Use of resistant varieties	
	2. Wilt (*Fusarium lini* Bolley)	-do-	Moderately severe	-do-	
Sesamum	1. Phyllody (virus)	Andhra, Delhi, Madras, Uttar Pradesh and perhaps elsewhere also	—	No satisfactory control measures known.	
Groundnut	1. 'Tikka' disease (*Cercospora personata* B. and C.) Ell. and Everh. and *C. arachidicola* Hori)	Throughout India	Losses range from 2-50%.	Spraying with Bordeaux mixture or other copper fungicides or dusting with fine sulphur.	

	2. Clump or Rosette disease (virus)	In several parts of India.	Serious in some areas	Roguing and destruction of affected plants.	
FRUITS Citrus	1, Canker (*Xanthomonas citri* (Hasse) Dowson).	Throughout India	Very severe	Pruning of affected parts and spraying with Bordeaux mixture (5 : 5:50) or other copper fungicides.	
	2. Wither tip (*Colletotrichum gloeosporioides* Penzig)	-do-	-do-	-do-	Serious in northern India.
	3. Leaf fall and fruit rot (*Phytophthora palmivora* Butler)	Andhra, Coorg, Madras, Mysore.	-do-	Spraying with Bordeaux mixture (5 : 5 : 50) or other copper fungicides.	
	4. Gummosis (*Phytophthora* spp.)	In several parts of India.	Severe	Removal of the gum pockets and application of Bordeaux paste.	
	.Pink disease (*Pellicularia salmonicolor* (B. and Br.) Dast.)	-do-	-do-	Pruning of affected parts and application of Bordeaux paste to cuts and wounds and to the forks of the branches.	Serious in some areas of Madhya Pradesh.

Crop	Disease and Causal Organism	Distribution	Economic status	Control measures	Remarks
Citrus (*contd.*)	6. Powdery mildew (*Oidium tingitanium* Carter)	Andhra, Coorg, Hyderabad, Madras, Mysore, Travancore-Cochin.	Serious in some years	Dusting with fine sulphur.	Serious in Coorg
	7. Foliocellosis (Zinc deficiency)	In several parts of India	Serious in some localities	Spraying with zinc sulphate-lime mixture (10 lbs zinc sulphate, 5 lbs. lime and 100 gallons of water with a spreader).	Serious in Madras, Andhra and Assam.
Mango	1. Powdery mildew (*Oidium mangiferae* Berthet.)	Andhra, Bihar, Bombay, Coorg, Delhi, Hyderabad, Kutch, Madhya Pradesh, Madras, Mysore, Travancore-Cochin, Uttar Pradesh.	Serious in some localities	Dusting with fine sulphur.	Serious in Bombay and Hyderabad States and coastal areas of Saurashtra.
	2. Anthracnose (*Colletotrichum gloeosporioides* Penzig)	In several parts of India	Serious in Punjab	Removal of the affected parts and spraying the trees with Bordeaux mixture or other copper fungicides.	
	3. Phanerogamic parasite (*Loranthus* spp.) (*Dendrophthoe* spp.)	In most parts of India	Usually not serious	Eradication of the parasite.	Particularly serious in Bombay and Hyderabad.

Grape-vine	1. Powdery mildew (*Uncinula necator* (Schw.) Burr.)	Andhra, Bombay, Hyderabad, Kashmir, Madhya Pradesh, Madras, Mysore.	Severe	Dusting with fine sulphur.	
	2. Downy mildew (*Plasmopara viticola* Berl. and de Toni.)	-do-	-do-	Spraying with Bordeaux mixture (4 : 4 : 50) or other copper fungicides.	
	3. Anthracnose (*Gloeosporium ampelophagum* (de Bary) Sacc.)	Bombay, Hyderabad, Madhya Pradesh, Madras, Mysore.	-do-	-do-	
Banana	1. Panama wilt (*Fusarium oxysporum* var. *cubense* (E. F. S.) Wr. and Reink.)	Andhra, Assam, Bombay, Hyderabad, Madhya Pradesh, Madras, Orissa, West Bengal.	-do-	1. Eradication of affected plants and application of sulphur or lime to the soil in the pits. 2. Use of resistant varieties. 3. Flooding of the ground with 2″ of water to kill the fungus.	Serious in parts of Madras West Bengal and Hyderabad.
	2. Mosaic or Chlorosis, Bunchy top (Virus)	Bombay, Orissa, Travancore-Cochin.	Serious	1. Eradication of affected plants.	Serious in parts of Bombay and Travancore-Cochin.

Crop	Disease and Casual Organism	Distribution	Economic status	Control measures	Remarks
Banana (*contd.*)	Mosaic or chlorosis, Bunchy top (virus) (*contd.*)			2. Enforcement of domestic quarantine—Restricting movement of plant materials from the affected areas.	
Fig	1. Rust (*Cerotelium fici* (Cast.) Arth.)	Throughout India	-do-	Dusting with fine sulphur.	
Guava	1. Zinc deficiency	Ajmer	Incidence upto 50%	Spraying zinc sulphate-lime mixture (zinc sulphate 1.0 lb., hydrated lime 0.7 lb. and water 16 gallons).	
	2. Wilt (*Fusarium ~~orthoceras~~ oxysporum* var. *psidii* Prasad, Mehta and Lal)	Uttar Pradesh and perhaps West Bengal.	Serious	No satisfactory control measures known.	
	3. Anthracnose (*Colletotrichum psidii* Curzi)	In most parts of India	Serious in some areas	1. Removal and destruction of the mummies. 2. Spraying with Bordeaux mixture (1%) or Lime sulphur (1 : 25) at intervals of 15 days.	Serious in Uttar Pradesh in the rainy season.

Apple	1. Scab (*Venturia inaequalis* (Cooke) Wint.)	Kashmir, Punjab	Serious	Spraying Lime sulphur or other fungicides.	
	2. Stem-black (*Coniothecium chomatosporum* Corda)	Uttar Pradesh	Incidence upto 60%	Removal and destruction of diseased branches and application of Chaubattia paste* or Bordeaux paste to cut surfaces and other affected areas.	*Chaubattia paste consists of 4 parts of copper carbonate, 4 parts of red-lead and 5 parts of lanoline.
	3. Stem brown (*Botryosphaeria ribis* G. & D.)	-do-	Serious	Pruning and destruction of the affected parts and application of Chaubattia paste or Bordeaux paste to cut surfaces and other affected areas.	
	4. Pink disease (*Pellicularia salmonicolor* (B. and Br.) Dast.)	Uttar Pradesh	Serious	1. Painting the forks of the branches before the onset of the monsoon with Chaubattia or Bordeaux paste. 2. Excision of diseased material at least 2 feet before the last site of invasion and burning it.	

Crop	Disease and Causal Organism	Distribution	Economic status	Control measures	Remarks
Apple (*contd.*)	5. Soft rot (*Penicillium expansum* Thom.)	Throughout India	Upto 75% loss may be caused in transit and storage, in extreme cases.	Avoidance of skin injuries to fruits in picking and packing and use of wrappers treated in double-boiled linseed oil.	
	6. Mildew (*Podosphaera leucotricha* (Ell. and Everh.) Salm.)	Kashmir, Mysore, Punjab, Uttar Pradesh	No definite information available.	Dusting with fine sulphur.	Usually a serious disease of seedlings.
Pineapple	1. Soft rot (*Ceratostomella paradoxa* (de Seynes) Dade)	Assam, Madhya Pradesh, Madras, Uttar Pradesh, West Bengal, Travancore-Cochin	Upto 50% loss may be caused in transit and storage of fruits.	1. Use of healthy and disease-free suckers for planting. 2. Clean cultivation and destruction of diseased material by burning.	Reported to be fairly serious in Assam.
	2. Heart or stem rot (*Phytophthora parasitica* Dastur)	Assam and probably elsewhere.	No definite information available.	1. Thorough drainage of soil. 2. Use of vigorous planting material. 3. Dipping the planting materials in very heavy Bordeaux mixture (1:1:3) before planting.	

Papaya	1. Stem rot (*Pythium aphanidermatum* (Edson) Fitz.)	In several parts of India	Serious	1. Avoidance of water logging. 2. Removal and burning of badly affected plants. 3. Application of Bordeaux paste or spraying stumps with Bordeaux mixture (6 : 6 : 50).	
	2. Virus disease	In several parts of India	A disease of minor importance.	Removal of the diseased plants for arresting the spread of the disease.	
Peach	Leaf curl (*Taphrina deformans* (Berk.) Tul.)	do	-do-	Spraying Bordeaux mixture (4 : 4 : 50) or other copper fungicides.	The disease is common in hills (over 4,000 feet).
Pear	1. Stem black 2. Pink disease 3. Soft rot	.....	As under apple above	.....	
	4. Leaf spot (*Phyllosticta pirina* Sacc.)	Punjab, Uttar Pradesh, West Bengal	Serious	Spraying Bordeaux mixture (4 : 4 : 50) or other copper fungicides.	

Crop	Disease and Causal Organism	Distribution	Economic Status	Control measures	Remarks
Cashew nut	Die back (*Pellicularia salmonicolor*)	West coast of Madras, Travancore-Cochin	-do-	Pruning of affected branches and their destruction by burning and application of tar or Bordeaux paste to the cut ends.	
Ber (*Zizyphus jujuba*)	Powdery mildew (*Oidiopsis* sp.)	Uttar Pradesh	Serious in certain localities	Dusting with fine sulphur.	
Jack fruit	Fruit rot (*Rhizopus artocarpi* Racib.)	Throughout India	Serious in areas with heavy rainfall	Spraying the young fruits with Bordeaux mixture (2: 2: 50), at intervals of 3 weeks	
VEGETABLES					
Potato	1. Early blight (*Alternaria solani* Ell. and Mart.) Jones and Grout)	-do-	Loss usually upto 5%, serious in epidemic years	Spraying the crop with Bordeaux mixture (4: 4: 50), other copper or organic fungicides.	
	2. Late blight (*Phytophthora infestans* (Mont.) deBary)	Assam, Bihar, Himachal Pradesh, Punjab, Tripura, PEPSU. Uttar Pradesh, West Bengal.	Loss usually 15-25%, upto 65% in epidemics.	-do-	A disease of common occurrence in the hills. The disease is also becoming serious in the Indo-gangetic plain, particularly in W. Bengal. Bihar and Uttar Pradesh.

3. Charcoal rot (*Botryodiplodia* sp.)	Bihar, and probably elsewhere also.	Usually not serious. Loss of 50% or more in severe outbreaks.	1. Early harvesting of the crop when the weather is comparatively cool. 2. Use of resistant varieties.	Serious in parts of Bihar
4. Black scurf (*Rhizoctonia solani* Kuhn)	In several parts of India	Usually not serious	1. Selection of disease-free tubers for planting. 2. Treatment of the tubers with formalin (1 : 120) or mercuric chloride (1 : 1,000) solution before planting.	Reported to be widespread in Orissa and Punjab.
5. Ozonium wilt (*Ozonium texanum* var. *parasiticum* Thirum.)	Bihar, Himachal Pradesh, Uttar Pradesh	-do-	Disinfection of the soil with 1 : 1,000 mercuric chloride solution before planting.	
6. Dry rot (*Fusarium caeruleum* (Lib.) Sacc.)	In several parts of India	-do-	Disinfection of the godowns, containers (baskets, etc.) and the tubers with 1:120 formalin solution before storage.	

Crop	Disease and Causal Organism	Distribution	Economic Status	Control measures	Remarks
Potato (*contd.*)	7. Bacterial wilt (*Pseudomonas solanacearum* (Smith) Dowson)	Assam, Bihar, Bombay, Madras, Mysore, Punjab, Travancore-Cochin, Uttar Pradesh, West Bengal	Loss usually 2-5%	1. Use of disease-free potato tubers as seed. 2. Disinfection of the cutting implements.	
	8. Virus diseases	Throughout India	Fairly severe in some areas, upto 50% loss may be caused in epidemics.	1. Seed-certification 2. Roguing of diseased plants.	
Chillies	Fruit rot & Die back (*Colletotrichum capsici* (Syd.) Butler & Bisby)	-do-	Serious under favourable conditions	Spraying with Bordeaux mixture (4: 4: 50) or other copper fungicides.	Particularly severe in Madhya Pradesh, Hyderabad, Madras and Bihar.
Cruciferous vegetables	1. Damping off (*Pythium* spp., *Phytophthora* spp., *Rhizoctonia* spp., and *Sclerotium rolfsii* Sacc.)	Throughout India	Serious in some localities.	1. Drenching the soil in seed beds with formalin (1:50), at 1 gallon for 2 or 3 sq. ft. of soil a few weeks before planting the seed or pre-sowing soil treatment with formaldehyde dust* 2, Spraying the seedlings with 2 : 2 : 50	*Formaldehyde dust consists of 1 lb. of formaldehyde to 5-2/3 lbs. of inert dust.

				Bordeaux mixture, a week after their germination.	
	2. Downy mildew (*Peronospora parasitica* (Fr.) Tul.	-do-	Usually not serious	Spraying with Bordeaux mixture or other copper fungicides.	Particularly serious on radish
	3. Blight (*Alternaria brassicae* (Berk.) Sacc.)	-do-	-do-	Not definitely known	
	4. White rust (*Cystopus candidus* (Pers.) de Bary)	-do-	-do-	-do-	Particularly serious on radish
	5. Broom-rape (*Orobanche indica* Ham.)	In several parts of India.	-do-	Eradication of the parasite shoots before flowering.	
Cucurbits	1. Powdery mildew (*Erysiphe cichoracearum* (DC.)	Throughout India	Serious in some years	Dusting the crop with fine sulphur.	
	2. Downy mildew (*Pseudoperonospora cubensis* (Berk. and Curt.) Rost.)	In several parts of India.	Usually not serious	Spraying the crop with Bordeaux mixture or other copper fungicides.	

Crop	Disease and Causal Organism	Distribution	Economic Status	Control measures	Remarks
Cucurbits *Contd.*)	3. Fruit rots (*Pythium aphanidermatum* (Eds. Fitz.) and *Colletotrichum lagenarium* (Pass.) Ell. and Halst.)	-do-	Serious in some areas	As in downy mildew	
Tomato	1. Damping off (*Pythium* spp., *Phytophthora* spp., and *Rhizoctonia* spp.)	Throughout India	-do-	1. Seed treatment with organic or organomercurial compounds 2. Pre-sowing soil treatment with formaldehyde dust (1 lb. formaldehyde to 5-2/3 lbs. of an inert dust) 3. Spraying of seed beds with Cheshunt* compound.	*Cheshunt compound consists of Copper sulphate 2 ozs, Ammonium carbonate 11 ozs, mixed and stored in a sealed glass vessel for 24 hours. One ounce of the mixture is dissolved in 2 gals. of water and used for sprinkling seed beds.

	2. Virus diseases.	Throughout India	Serious	1. Roguing of the affected plants in the early stage. 2. Spraying or dusting the crop with insecticides for the control of insect vectors.
	3. Broom-rape (*Orobanche cernua* Loefl.)	In several parts of India	Serious in some areas	Eradication of the parasite shoots before flowering.
Brinjal	1. Virus disease (*Little leaf*)	Throughout India	Serious	Spraying or dusting the crop with insecticides for the control of insect vectors.
	2. Leaf spots (*Alternaria solani* (Ell. & Mart.) Sor. sensu Jones and Grout, *Cercospora solani* Sacc., *Phyllosticta* sp., etc.)	-do-	-do-	1. Eradication of the infected material. 2. Spraying the crop with Bordeaux mixture (4 : 4 : 50) or other copper fungicides.
	3. Wilt (*Fusarium oxysporum f. lycopersici* (Sacc.) Snyder and Hansen)	-do-	-do-	Eradication of diseased plants.

Crop	Disease and Causal Organism	Distribution	Economic Status	Control measures	Remarks
	4. Broom-rape (*Orobanche cernua* Loefl.)	In several parts of India	Serious in some areas	As under Tomato.	
Lady's finger	1. Yellow vein mosaic (virus)	-do-	Serious	1. Eradication of *Hibiscus tetraphyllus* weed. 2. Spraying the crop with fish-oil rosin soap or other insecticides for the control of insect vectors.	
	2. Leaf spots (*Cercospora hibisci* Tracy and Earle, *Alternaria* sp., etc.)	-do-	A disease of minor importance	Spraying the crop with Bordeaux mixture (4 : 4 : 50) or other copper fungicides.	
	3. Damping-off (*Pythium* spp., and *Rhizoctonia* spp.)	-do-	-do-	As under brinjal, tomato, etc.	
Bean	1. Powdery mildew (*Erysiphe polygoni* DC.)	In most parts of India	A disease of minor importance.	Dusting the crop with fine sulphur.	

	2. Anthracnose (*Colletotrichum lindemuthianum* (Sacc. & Magn.) Br. et Cav.)	-do-	Serious in French beans	Planting of healthy seed	
	3. Rust (*Uromyces appendiculatus* (Pers.) Lev.)	-do-	Usually not serious	Dusting with fine sulphur (300 mesh) if the disease appears in a serious form.	Serious in parts of southern India.
Cluster-beans	Powdery mildew (*Leveillula taurica* (Lev.) Arn.)	Throughout India.	No definite information available.	Dusting the crop with fine sulphur.	
Colocasia antiquorum	Blight (*Phytophthora colocasiae* Rac.)	-do-	Light to severe.	Spraying the crop with Bordeaux mixture (4 : 4 : 50) or other fungicides.	
PLANTATION CROPS					
Coffee	1. Leaf disease (*Hemileia vastatrix* Berk. and Br.)	Coorg, Madras, Mysore, Travancore-Cochin.	Serious, 50-67% loss may be caused.	Spraying the crop with Bordeaux mixture (2 : 2 : 50) or other copper fungicides.	
	2. Black rot (*Corticium koleroga* (Cooke) Hohnel)	-do-	Definite information not available.	-do-	
	3. Die back (*Colletotrichum coffeanum* Noack)	-do-	-do-	-do-	

Crop	Disease and Casual Organism	Distribution	Economic Status	Control measures	Remarks
Coffee (*contd.*)	4. Nursery Collar rot or Damping-off (*Rhizoctonia* sp. and *Fusarium* sp.)	-do-	15-30% loss may be caused.	1. Collection and burning of all infected seedlings. 2. Drench-spraying of Bordeaux mixture (2 : 2 : 50), not only to cover the seedlings' surface but also to soak the soil to a depth of 4-6". The operation has to be repeated 2-3 times every fourth day.	
	5. Stump-rot or brown root disease (*Fomes noxius* Corner)	-do-	Serious in some localities.	Removal of infected bushes and collection and burning of all diseased material.	
Tea	1. Blister blight (*Exobasidium vexans* Massee)	Assam, Coorg, Madras, Mysore, Travancore-Cochin, West Bengal.	Very serious in epidemic years.	Spraying with Bordeaux mixture or other copper fungicides or dusting with copper dusts.	Particularly severe in the Nilgiris.
	2. Red rust (*Cephaleuros parasiticus* Karsten)	-do-	Serious in some years	Spraying with Bordeaux mixture (1%) or other copper fungicides.	

	3. Brown blight (*Colletotrichum camelliae* Massee)	Assam, Coorg, Madras, Mysore, Travancore-Cochin, West Bengal.	-do-	-do-
	4. Grey blight (*Pestalozzia theae* Sawada)	-do-	-do-	-do-
	5. Stump-rot or brown root disease (*Fomes noxius* Corner)	-do-	Serious in some localities	Removal of infected bushes and collection and burning of all diseased material.
	6. Charcoal stumprot (*Ustulina zonata* (Lev.) Sacc.)	-do-	-do-	Eradication of the affected bushes.
	7. Red root rot (*Sphaerostilbe repens* Berk. and Br.)	-do-	-do-	-do-
Rubber	1. Leaf blight (*Phytophthora meadii* McRae)	Travancore-Cochin	-do-	Spraying with Bordeaux mixture or other fungicides.
	2. Powdery mildew (*Oidium heveae* Steinm.)	-do-	-do-	Dusting with fine sulphur.
Arecanut	1. Fruit rot (*Phytophthora palmivora* Butler)	Assam, Bombay, Madras, Mysore, Travancore-Cochin.	Serious	Spraying with Bordeaux mixture (5: 5: 50) or other copper fungicides.

Crop	Disease and Casual Organism	Distribution	Economic status	Control measures	Remarks
Arecanut (*contd.*)	2. Foot rot (*Ganoderma lucidum* (Leyss. Ex. Fr.) Karst.)	Assam, Bombay, Mysore, West Bengal.	Serious in some areas	1. Application of sulphur dust to the base of the tree. 2. Removal of the dead trunks of palms and their disposal by burning.	Particularly serious in Mysore.
Coconut	1. Nut fall and bud rot (*Phytophthora palmivora* Butler)	Andhra, Assam, Bombay, Madhya Pradesh, Madras, Mysore, Orissa, Travancore-Cochin, West Bengal.	Fairly serious	Spraying with Bordeaux mixture (5: 5: 50) or other copper fungicides.	
	2. Leaf rot (*Helminthosporium halodes*, *Colletotrichum paucisetum* and *Gliocladium roseum*)	-do-	-do-	Spraying the crown and leaves with 1% Bordeaux mixture or other copper fungicides.	
DRUGS AND NARCOTICS					
Tobacco	1. Damping-off (*Pythium aphanidermatum* (Edson) Fitz.)	Throughout India.	-do-	1. Soil sterilization. 2. Spraying nursery beds and the seedlings with Bordeaux mixture (2 : 2 : 50) or other copper fungicides.	

	2. Leaf spot (*Cercospora nicotianae* Ell. and Everh.)	-do-	No definite information available.	Spraying with Bordeaux mixture (1%) or other copper fungicides.
	3. Black shank (*Phytophthora parasitica* Dastur var. *nicotianae* Tuck.)	-do-	-do-	-do-
	4. Virus diseases.	-do-	Serious	Eradication of affected plants.
	5. Broom rape (*Orobanche cernua* Loefl. var. *deserborum* Beck.)	-do-	-do-	1. Eradication of the parasite shoots before flowering. 2. Growing of trap crop, viz., chillies. 3. Treatment with herbicides (e.g., Crag herbicide, as a pre-emergence treatment.)
FODDER CROPS				
Lucerne	1. Powdery mildew (*Leveillula taurica* (Lev.) Arn.)	Throughout India	Serious under favourable weather conditions.	Dusting the crop with fine sulphur (300 mesh).

Crop	Disease and Causal Organism	Distribution	Economic status	Control measures	Remarks
Lucerne (*contd.*)	2. Downy mildew (*Peronospora trifoliorum* de Bary)	-do-	-do-	Spraying the crop with Bordeaux mixture or other copper fungicides in severe cases.	
	3. Rust (*Uromyces striatus* Schroet.)	-do-	No definite information available.	In severe attacks, the crop can be dusted with fine sulphur (300 mesh).	
	4. Dodder (*Cuscuta arvensis* Bey.)	Bhopal and perhaps elsewhere	Serious in some areas	1. Growing dodder-free seed. 2. Use of dodder-free lucerne or berseem fodder. 3. Preventing grazing animals from infested to clear fields. 4. Restricting the flow of irrigation water. 5. Avoiding the use of dodder-containing manure. 6. Destruction of the crop by burning before seeding. 7. Leaving the ground fallow and then following a five year	

				rotation beginning with a non-leguminous crop.	
Berseem	1. Root rot (*Pellicularia filamentosa* (Pat.) Rogers)	Uttar Pradesh and perhaps elsewhere also.	Occasionally serious in some localities	No satisfactory control measures are known.	
	2. Dodder (*Cuscuta arvensis* Bey.)	-do-	-do-	As under Lucerne.	
SPICE CROPS					
Turmeric	1. Leaf spot (*Colletotrichum capsici* (Syd.) Butler and Bisby)	Andhra, Bombay, Hyderabad, Madhya Pradesh, Madras, Mysore, West Bengal	No definite information available.	Spraying the crop with Bordeaux mixture (1%) or other copper fungicides.	Serious in Andhra and Madras
	2. Leaf spot (*Taphrina maculans* Butl.)	Assam, Bihar, Bombay, Uttar Pradesh, West Bengal	-do-	Spraying the crop with Bordeaux mixture (4:4:50) or other copper fungicides.	Serious in Bihar
Betelvine	1. Foot rot (*Phytophthora parasitica* Dastur)	Throughout India	Very serious in epidemic years.	Spraying the vines and the soil round the base of the plants with Bordeaux mixture (2:2:50) or other copper fungicides.	Particularly serious in Madhya Pradesh, Uttar Pradesh and Vindhya Pradesh.

Crop	Disease and Causal Organism	Distribution	Economic status	Control measures	Remarks
Ginger	Rhizome rot (*Pythium* spp.)	Throughout India	No definite information available.	1. Treatment of the rhizomes with mercuric chloride (1:1000) before storage. 2. Spraying the soil and seedlings with Bordeaux mixture (4:4:50) or other copper fungicides	
Cumin	Powdery mildew (*Erysiphe polygoni* DC.)	Ajmer, Bombay, Madhya Pradesh, Rajasthan, Uttar Pradesh	Upto 50% loss during epidemics.	Dusting with fine sulphur.	Particularly severe in Bombay and Rajasthan.
Coriander 1.	-do-	-do-	-do-	-do-	
2.	Tumour (*Protomyces macrosporus* Unger)	Assam, Bihar, Punjab, Uttar Pradesh, West Bengal	Upto 50% loss in epidemic years.	Satisfactory control measures not known.	
Cardamom 1.	Marble disease (Virus)	Bombay, Madras, Mysore, Travancore-Cochin	Serious	1. Eradication of affected plants 2. Planting of healthy seedlings raised under disease-free conditions	

			3. Prohibition of the importation of rhizomes and living plant material from diseased to healthy localities.
2. Foorki disease (Virus)	West Bengal	-do-	-do-

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